AN ILLUSTRATED RECORD OF THE DEVELOPMENT OF THE BRITISH ARMOURED FIGHTING VEHICLE

●

TANKS

1915 - 1918

The

First World War

THE

ROYAL ARMOURED CORPS TANK MUSEUM

BOVINGTON · DORSET

KENNETH W. LARSEN
17206 COMMUNITY
LANSING, ILL.

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The following publications are on sale :—

"TANKS, 1915—1918:
The First World War".

"TANKS, 1919—1939:
The Inter War Period."

"TANKS, 1940—1946:
The Second World War."

"ARMOURED CARS,
1900—1945."

"TANKS OF OTHER
NATIONS."

These booklets are an illustrated record of the development of the armoured fighting vehicle. They may be purchased singly or as a set.

Every effort has been made to ensure the accuracy of the information given, but the Curator would welcome particulars of any inaccuracies which have unknowingly been included.

The address to which all communications should be sent is:—

THE CURATOR,
ROYAL ARMOURED CORPS
TANK MUSEUM,
BOVINGTON CAMP,
WAREHAM, DORSET.

A few words about the Museum

THE Museum was formed in 1923 after a visit to Bovington by Rudyard Kipling who, seeing these historic vehicles rusting in the open, suggested they be housed in a shed. This was done but the display was not opened to the public.

In 1939 owing to the need for more training space the exhibits were again dispersed. Some were unfortunately sent away as scrap and others used as local defence strong points.

After 1946 the survivors were re-assembled and finally housed in the present building.

When the School of Tank Technology moved to Bovington in 1951 it brought with it a collection of British and Foreign Armoured fighting vehicles.

These were added to the existing display and since then further exhibits have been acquired by gift and purchase.

In accordance with its Charter the Museum is concerned only with armoured fighting vehicles, their components and auxiliaries, together with related documents and relics which are of historical, operational or technical importance and interest. From 1923 to 1939 the exhibits mainly concerned the Royal Tank Corps and its units. In 1939 the Royal Armoured Corps was formed. This Corps comprises all the Regular and Territorial units of the Cavalry and Royal Tank Regiments. During the second war units of other arms were equipped with tanks or armoured cars and served in armoured divisions, tank brigades and the Reconnaissance Corps. The scope of the Museum today covers all the above.

The display is a comprehensive one and demonstrates the development of armour from 1915 to present times. Although primarily of historical and technical interest it is also intended to appeal to those more generally interested in the tank and armoured car as fighting machines. The vehicles are grouped according to date, type and origin. Each section contains battle exhibits, relics and photographs relating to the vehicles in it.

In those who trained and fought with or against some of the vehicles on view memories of more active days will be awakened. In others a study of them will bring an appreciation of the conditions under which the crews operated and maintained the machines, particularly the earlier ones.

A technical and historical reference library is available to students of armoured fighting vehicle history and design but no books or documents may be taken away.

All exhibits are obsolete and there are no security restrictions. Photography is permitted.

Gifts or loans of any sort which will improve the collection will be gratefully acknowledged by the Curator on behalf of the Trustees.

All enquiries or communications should be made to the Curator, R.A.C. Tank Museum, Bovington Camp, Dorset, either at the office or in writing.

The origin of the tank

VERY early in the 1914-18 war defence became too strong for offence owing to the power of machine-guns, assisted by barbed wire, and the increase in artillery. After the First Battle of Ypres this factor resulted in a stalemate on the British front which lasted for three years.

Both sides increased their artillery enormously in an attempt to break the deadlock. The Germans tried gas. Neither development was really successful, and the First Battle of the Somme, with its appalling casualties, made it apparent that a new method of crossing the deadly fire-swept zone of 'No Man's Land' must be found.

At Cambrai, where tanks were used correctly for the first time, the real solution was found. Tanks proved capable of destroying machine-guns and crushing down the wire, thus enabling a successful assault to be delivered against the strongest defence.

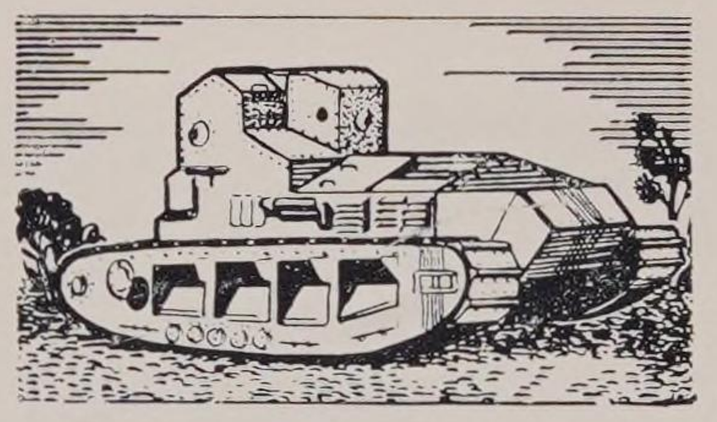
These are the circumstances in which the tank originated. But it did not owe its birth entirely to the tactical needs of 1914-18. As long ago as 1482 Leonardo da Vinci was writing of covered chariots mounting guns. The idea recurs constantly throughout military history.

All these early efforts failed in one particular. They had insufficient power. Even the steam engine could not produce the high power-to-weight ratio that was necessary to provide the three essentials of the tank—armour plating, guns and obstacle-crossing ability. Indeed, until the invention of the petrol engine the tank was impracticable.

It was just prior to the 1914-18 war that the petrol engine became a sufficiently reliable and efficient machine to make its use in a tank possible. The idea must have occurred to many mechanically minded people at the time. The earliest record preserved in the Museum is a copy of the drawing for a machine submitted to the War Office by a Mr. de Mole, an Australian, in 1912. Although it was not used, this design bears a good deal of resemblance to the first tanks actually produced. The drawing is reproduced inside the back cover of this Booklet.

Most of the credit for the rapid evolution of the tank as a practical fighting machine must, however, be given to a very small band of enthusiasts. Amongst them they combined a complete knowledge of tactical requirements gained first-hand in the field with a thorough knowledge of the capabilities of the petrol engine and the caterpillar track, and they had the ability

and enthusiasm to exploit their knowledge and develop the tank despite many and varied difficulties.



During the autumn of 1914 armoured cars had been employed in North Belgium and North West France and their limitations quickly became evident under active service conditions. By October, 1914, Lieut.-Col. Swinton[1] was suggesting that the armoured car should be fitted with caterpillar tracks to enable it to cross trenches and flatten barbed wire entanglements. The idea received little encouragement from the authorities, despite an urgent plea which Mr. Churchill[6] made to Mr. Asquith, the Prime Minister at the time.

It was not until June, 1915, that Lieut.-Col. Swinton was able to secure the support of the Commander of the British Expeditionary Force in France, Sir John French, who agreed to give official backing to the idea of the tank. Meanwhile, in the spring of 1915, the Admiralty had become interested in the idea of a landship and had formed a Committee to investigate the matter under Mr. D'Eyncourt.[2] This Committee took as the basic requirement for their design the specification suggested by Lieut.-Col. Swinton. Two of the experts connected with this Committee were to play a major part in the subsequent development of tank design. They were Lieut. W. G. Wilson, R.N.A.S.,[3] and Mr. William Tritton[4], of Messrs. William Foster & Co., a firm which was already making tracked vehicles under the trade name of 'Centipede'.

The War Office and the Admiralty combined their efforts in the Summer of 1915 and the first prototypes, 'Little Willie' and 'Big Willie' were ready for trials by September, 1915, and February, 1916, when Sir Douglas Haig, then commanding in France, sent Major H. J. Elles[5] home to report on them. The choice was a fortunate one, for Major Elles was to play a decisive part in the rapid formation and development of the Royal Tank Corps.

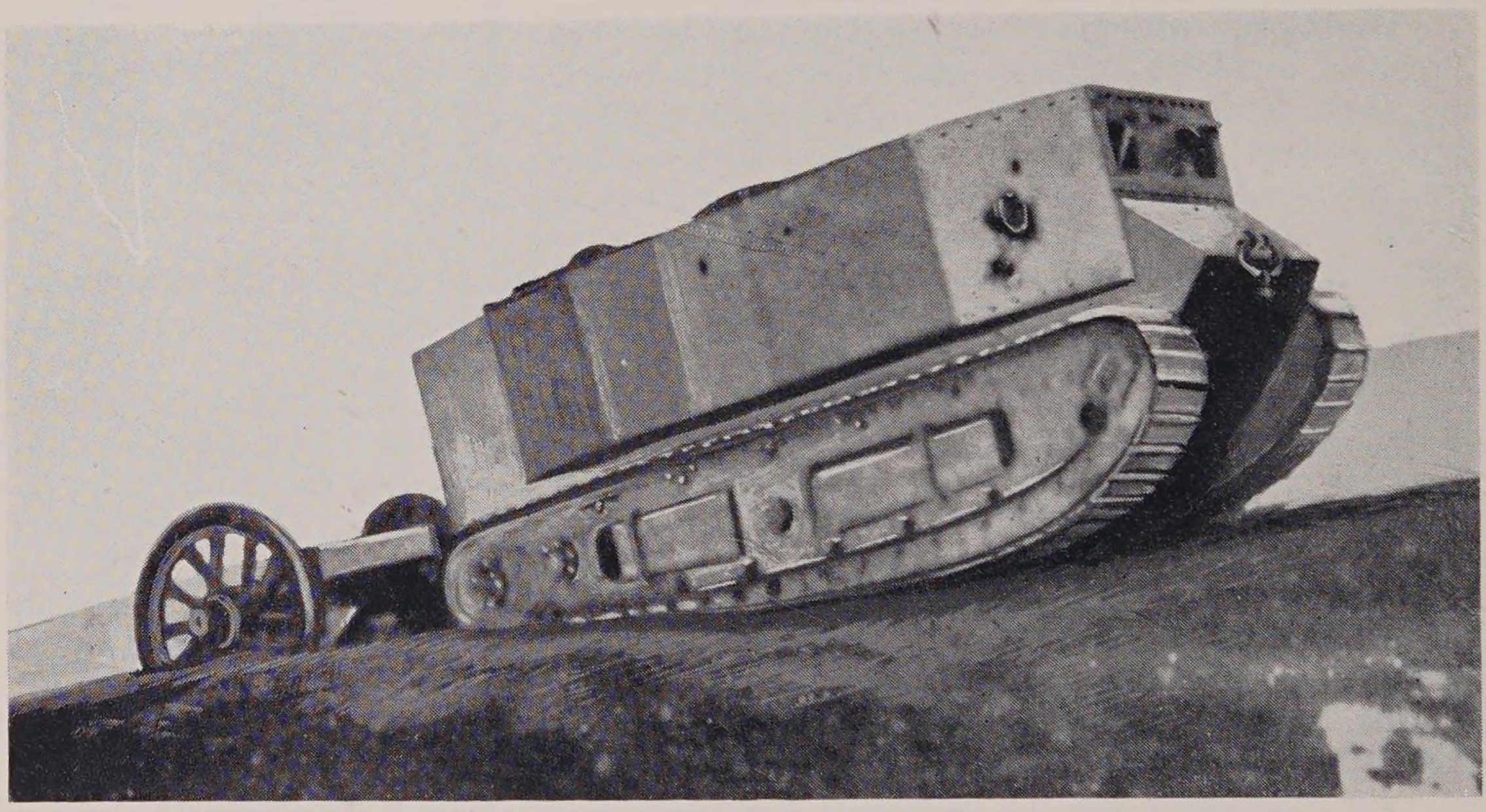
The scope of this Booklet is, however, limited to the development of the tank as a machine. The story of the men who fought them is told in their Regimental histories, some of which are on sale in the museum.

To those who were connected with tanks in the 1914-18 war, the steady, Mark-by-Mark progress which this Handbook implies will seem misleading. It is, however, true to say that design did develop in this way. But the demand for tanks was always too urgent to allow for delays in production which would have been necessary if production models were to incorporate the latest designs in all cases.

Many of the improvements which subsequently became the main feature of the new Marks, were first introduced in earlier Marks. As a result many 'Hybrid' tanks were built, having the characteristics of more than one Mark as described in this Handbook.

[1] Later Major-General Sir E. D. Swinton, K.B.E., C.B., D.S.O.
[2] Later Sir Eustace H. W. Tennyson D'Eyncourt, K.C.B.
[3] Later Major W. G. Wilson, C.M.G.
[4] Later Sir William A. Tritton.
[5] Later General Sir Hugh Elles, K.C.B., K.C.M.G., K.C.V.O., D.S.O.
[6] Later Sir Winston S. Churchill, K.G., O.M., C.H.

LITTLE WILLIE



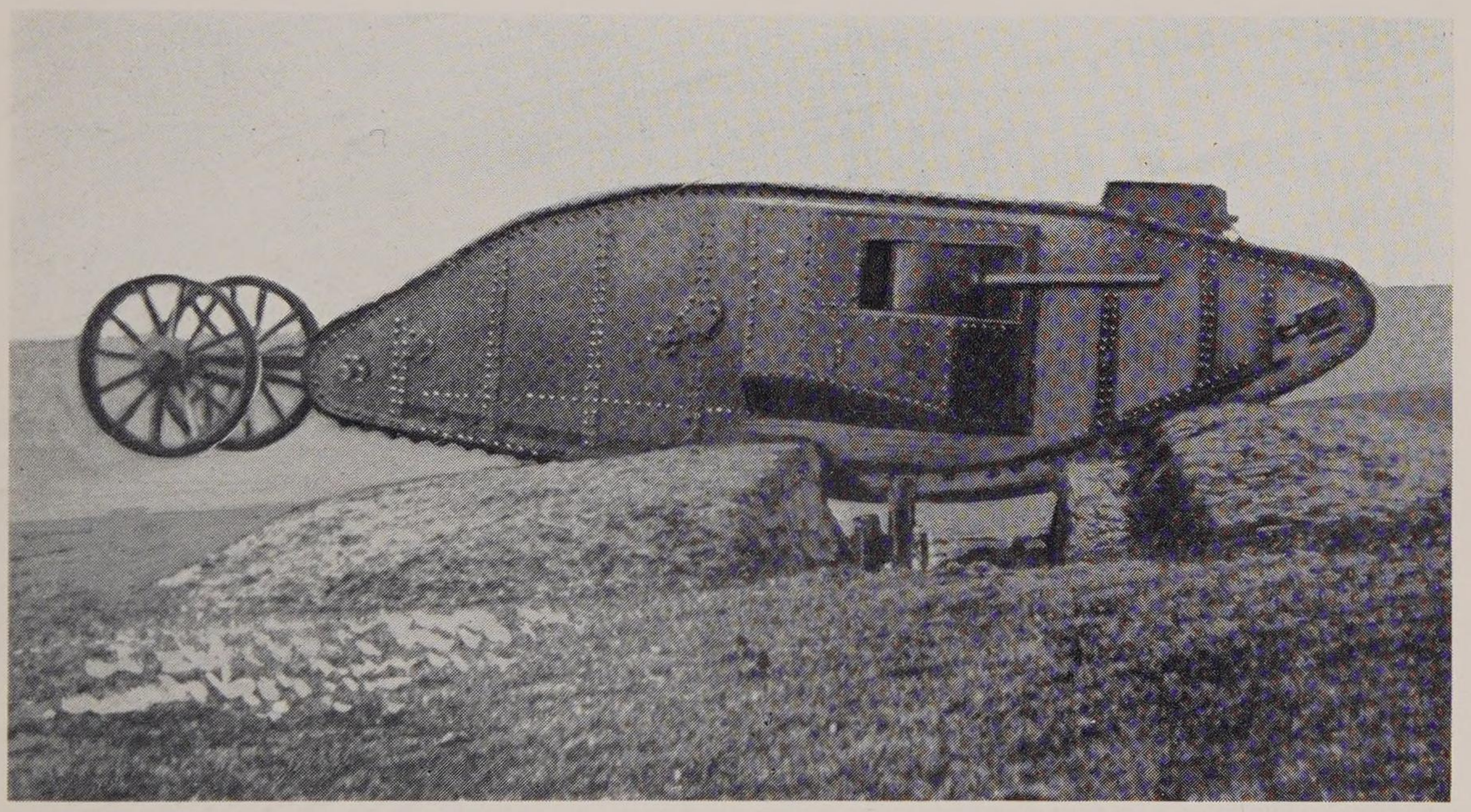
'Little Willie' was built in September, 1915, and its first trials were witnessed by His Majesty King George V on Thetford Heath, Norfolk, in the same month. It was designed by Sir William Tritton and built by Messrs William Foster & Co. Produced under the auspices of the Naval Committee, the engine, gearbox and differential of the pre-war Foster Daimler tractor were adopted.

As a first attempt, it was strikingly successful, but its balance proved rather defective and it lacked the obstacle-crossing capacity of 'Big Willie', the next prototype. The design was therefore abandoned, but 'Little Willie' was put to good use as a training tank at Hatfield, where it went in June, 1916. It is now preserved in the Museum, but unfortunately its steering tail has been removed and cannot be traced.

The vehicle was powered by a 105 h.p. 6-cylinder sleeve-valve engine, weighed 28 tons, was $26\frac{1}{2}$ ft. long and had a speed of $3\frac{1}{2}$ m.p.h. It was completely enclosed, with a door in the rear of the hull.

A steering tail was trailed behind the tank, consisting of a pair of wheels 4 ft. 6 ins. in diameter, which were kept in contact with the ground by springs. For a slight turn the wheels were turned by means of wire ropes operated by hand by the driver. For sharper turns the steering tail was lifted hydraulically, and the tank was steered on its secondary gearboxes as described in 'Early Tank Steering' overleaf.

MOTHER



'Big Willie' was very similar mechanically to 'Little Willie', but its high nose gave it a much greater obstacle-crossing capacity. It was therefore adopted as the prototype for a series of tanks which ran eventually to nine marks totalling over 2,300 machines, and bore the brunt of the tank fighting of the 1914-18 war. It is not surprising that 'Big Willie', known also as the 'Wilson' and 'H.M.L.S. Centipede' during its early days, soon became universally known as 'Mother'.

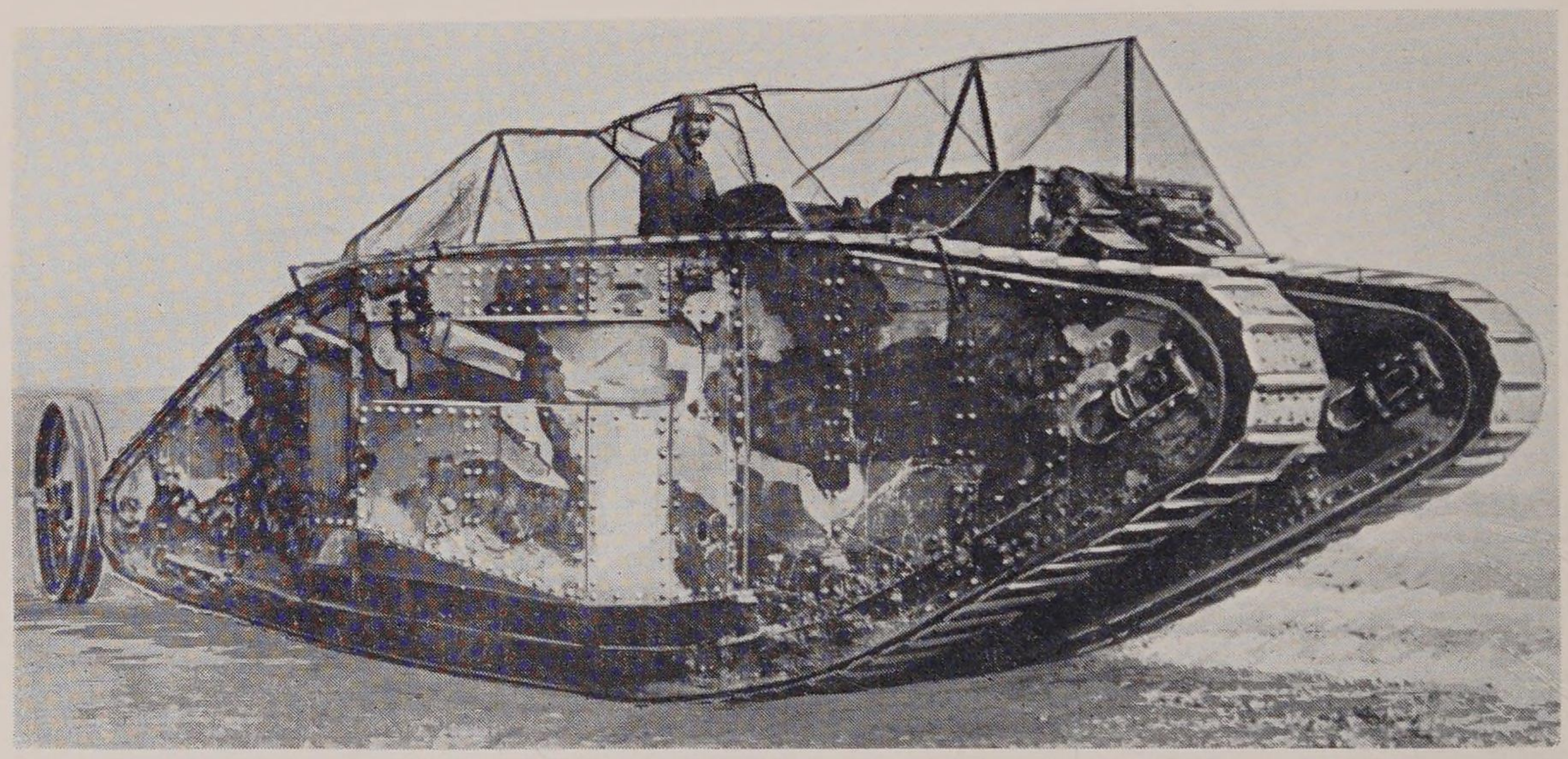
Built by Messrs. William Foster & Co. in 1915 to the design of Major Wilson and Sir William Tritton, it ran its trials on Poppleton's Fields, Lincoln, in January, 1916.

After several successful demonstrations one hundred of these machines were ordered. Their specification, which follows 'Mother's' closely, is given overleaf.

A special Unit of the Machine Gun Corps under Lieut.-Col. Swinton was formed to operate these machines. The evolution of the tank was proceeding under conditions of great secrecy, and the continued use of obviously descriptive names such as 'Landships' was undesirable. A new name was evolved jointly by Lieut.-Cols. Swinton and Dally Jones whilst Assistant Secretaries to the War Office Committee. They included it in a printed report on a Conference on December 24, 1915, and the word became officially and commonly used soon after that date. The Committee formed to organise the production of the first machines was therefore termed the Tank Supply Committee.

BRITISH FIGHTING TANKS—HEAVY

MARKS I, II and III



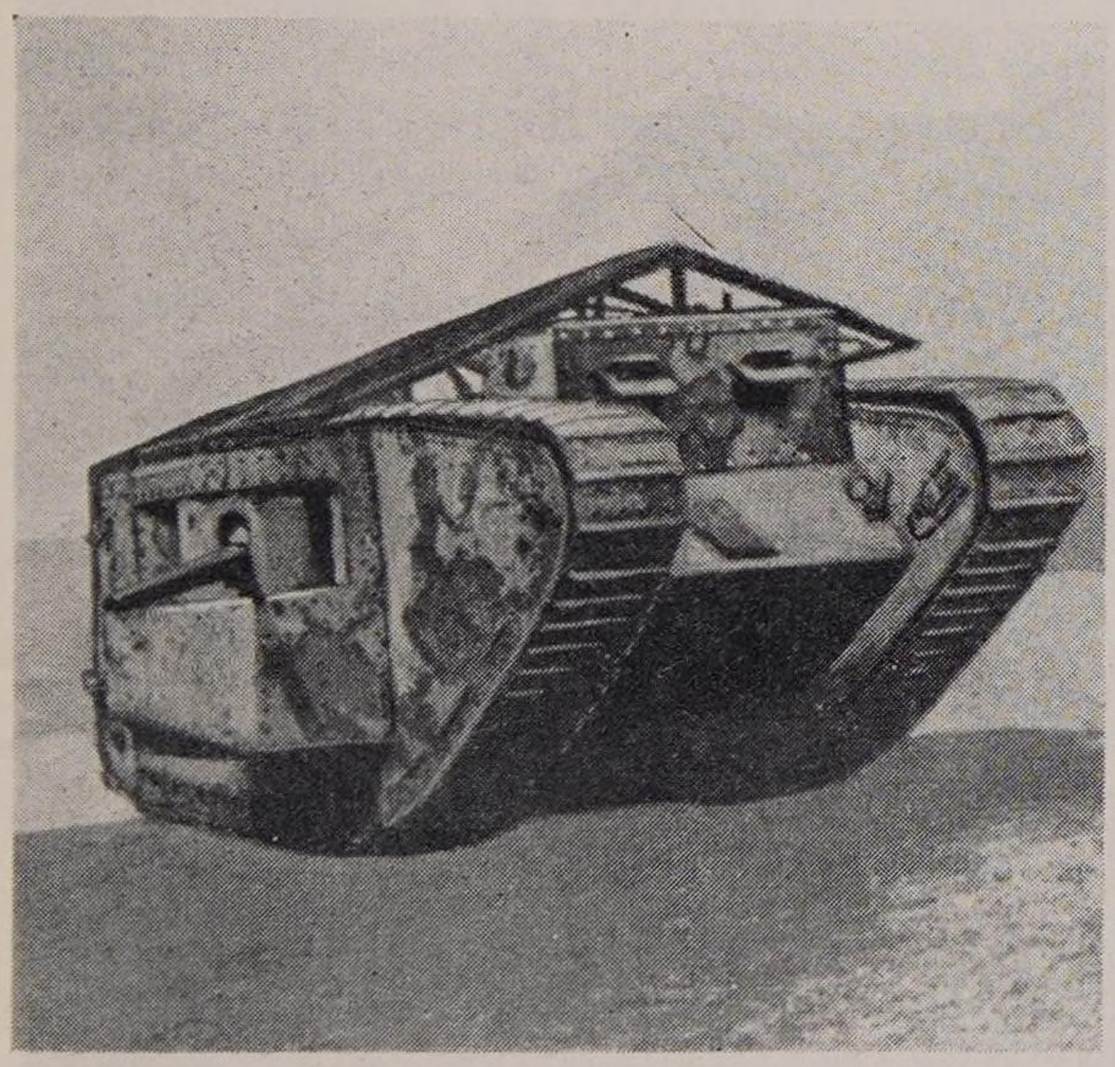
Altogether 150 machines were built to the specification given on the opposite page, and were designated Tanks Mark I. They were the first tanks used in action (on the Somme, September 15, 1916) and continued in use until about April, 1917. Two types were built, known as 'male' and 'female' tanks, the former carrying a six-pounder gun in each of their sponsons, whereas the latter were armed only with machine-guns.

Soon after the Mark I had been put into production a new design embodying a number of small improvements was introduced. Abandonment of the steering tail, heavier armour and provision for wider tracks were amongst the most important of these. Unfortunately the demand for tanks was so urgent that time could not be spared for the incorporation of most of these modifications, and essentially the Mark II and Mark III tanks (50 of each mark were built) remained the same as the Mark I.

The need for heavier armour was brought out later when the enemy found that the Mark I was not proof against his 'K' type armour-piercing machine-gun ammunition. He learnt this in the Battle of Bullecourt, in April, 1917, when he took two of our Mark I tanks 'alive'.

No provision was made in early tanks for splash proofing the inside of the hulls. As a result, a high proportion of face injuries through splash and flaking were sustained by the crews, who, as a protection, were issued with steel masks having a fringe of chain mail to protect the mouth and throat. Another serious disadvantage was the gravity feed petrol system, because of which the supply was completely cut off when the tank was ditched nose downwards, as frequently happened. It was then necessary to hand feed the carburettors with petrol drawn off from the tanks into small tins.

SPECIFICATION OF MARK I



General—

Weight (fully stowed)	Male	28 tons
	Female	27 tons
Overall length		26 ft. 5 ins.
do. with steering tail)		32 ft. 6 ins.
Overall width		13 ft. 9 ins.
Overall height		8 ft. 0½ ins.
Ground clearance		1 ft. 4½ ins.
Armour		
Maximum		12 mm.
Mininum		6 mm.
Petrol capacity		46 gals.

Engine

Daimler 6-cylinder sleeve-valve. (105 h.p. at 1,000 r.p.m.).

Crew

Eight: Commander, Driver, 2 Gearsmen, 4 Gunners.

Performance

Maximum vertical obstacle	4ft. 6 ins.
Maximum trench crossed	10 ft. 0 ins.
Road Speed	3.7 m.p.h.
Radius of action	23 miles

Steering

By steering tail.

By differential and secondary gears to each track, assisted by track brake for skid turns.

Armamemt

	Male	Female
6-pr. 40 calibre QF Hotchkiss gun	2	—
Hotchkiss machine-gun	4	1
Vickers light machine-gun	—	4

Ammunition

6-pr. shells	324	—
Small arms ammunition	6272	31232

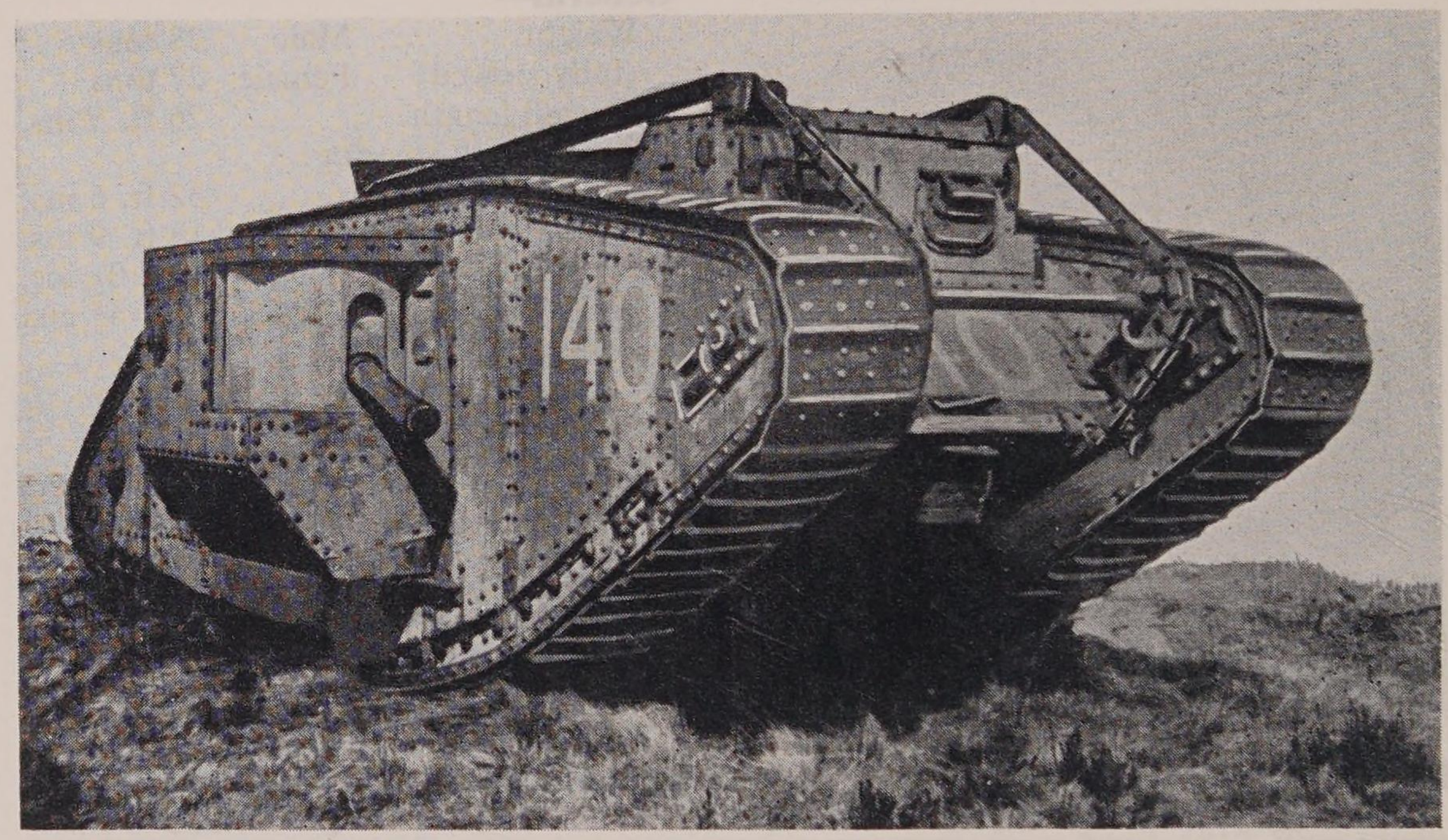
EARLY STEERING

Steering tail wheels (described under 'Little Willie') were abandoned at the close of the operations in 1916, when all tanks were shorn of their tails and no subsequent models were fitted with them. They proved cumbersome and particularly vulnerable to shell fire.

The most usual method of steering was to lock the differential and to select neutral in the secondary gearbox on the side to which it was desired to turn, the secondary gear on the opposite side remaining engaged in 'High' or 'Low' ratio. By applying the track brake on the neutral side an even sharper turn could be made.

When he desired to turn the driver conveyed his instructions to the gearsmen by first banging on the engine cover to attract their attention and then indicating which gear was to be engaged by holding up one or two fingers. Two fingers pointing downwards signified 'engage neutral.'

MARK IV



This tank was based on the results of experience in the field with the previous three Marks. Designed by Major Wilson late in 1916, a total of 1,015 tanks of this type were built—far more than any other tank used during the 1914-18 war. A brief specification of the Mark IV is given opposite. This type of tank was first used on August 7, 1917, and took part during that year in the Battles of Messines, Ypres and Cambrai. Some Battalions were still equipped with Mark IVs in 1918, and this tank figured prominently in many of the battles of that year also.

A male Mark IV fought the first tank versus tank battle, during the Battle of Villers-Bretonneux on April 26, 1918, when it drove off three German tanks after they had put two female tanks out of action. One of the enemy tanks overturned after having being hit. This action led to a number of female tanks being converted into 'Hermaphrodites' by fitting them with one six-pounder gun sponson to enable them to engage enemy tanks.

The Museum exhibit is a female tank which was discovered in 1943 on an aerodrome in Gloucestershire, where it was being used as a pillbox. It was originally armed with six Lewis machine-guns. The unditching beam is shown mounted on the unditching rails. When required for use it was attached to the track by chains and the differential was locked. The beam was thereby carried under the tank, and was a most effective means of recovery

An alternative form of unditching device was known as the torpedo spud and is also shown attached to the track of this exhibit. An illustration of the spud in use is included later in this Handbook. It could be used singly or in pairs, and superseded the original iron extension spuds which were attached to the track plates and were similar to the modern 'grousers' as fitted to American tanks.

In common with all 1914-18 war tanks, the suspension of the Mark IV is unsprung. The track, which consists of an endless chain of 90 armour plate shoes riveted to two track links, each link connected to the next by a mild steel oval-headed pin secured by a split pin, is supported on the upper surface of the tank by two long steel rails and 10 small bronze blocks. On the underside, the weight of the tank is supported by 26 pairs of rollers. There are two types of rollers, flanged and unflanged; the flanged rollers are fitted in the proportion of about one in three and their purpose is to guide the tank along the track. They also resist the tendency of the tank to move sideways on the track when turning quickly.

SPECIFICATION

General

Weight (fully stowed)	Male	28 tons.
	Female	27 tons
Overall length	...	26 ft. 5 ins.
Overall width	Male	13 ft. 6 ins.
	Female	10 ft. 6 ins.
Overall height	...	8 ft. 2 ins.
Width for conveyance by rail		
$20\frac{1}{2}$ ins. shoes		8 ft. $8\frac{1}{2}$ ins.
$26\frac{1}{2}$ ins. shoes		9 ft. 0 ins.

Note: Sponsons could be swung inboard for transit, instead of being taken off as on earlier marks.

Ground Clearance	...	1 ft. $4\frac{1}{2}$ ins.
Armour		
Maximum	...	12 mm.
Minimum ...	...	6 mm.
Petrol capacity	...	70 gals.

Engine

Daimler 6-cylinder sleeve-valve, 105 h.p.
(Increased in a limited number of later models to 125 h.p.)

Crew

Eight: Commander, Driver, 2 Gearsmen, 4 Gunners.

Performance

Maximum vertical obstacle		4 ft. 6 ins.
Maximum width of trench crossed	...	10 ft. 0 ins.
Road speed	...	3.7 m.p.h.
Radius of action	...	35 miles

Armament

	Male	Female
6-pr. 23 calibre QF Hotchkiss gun	2	—
Lewis machine-guns ...	4	6

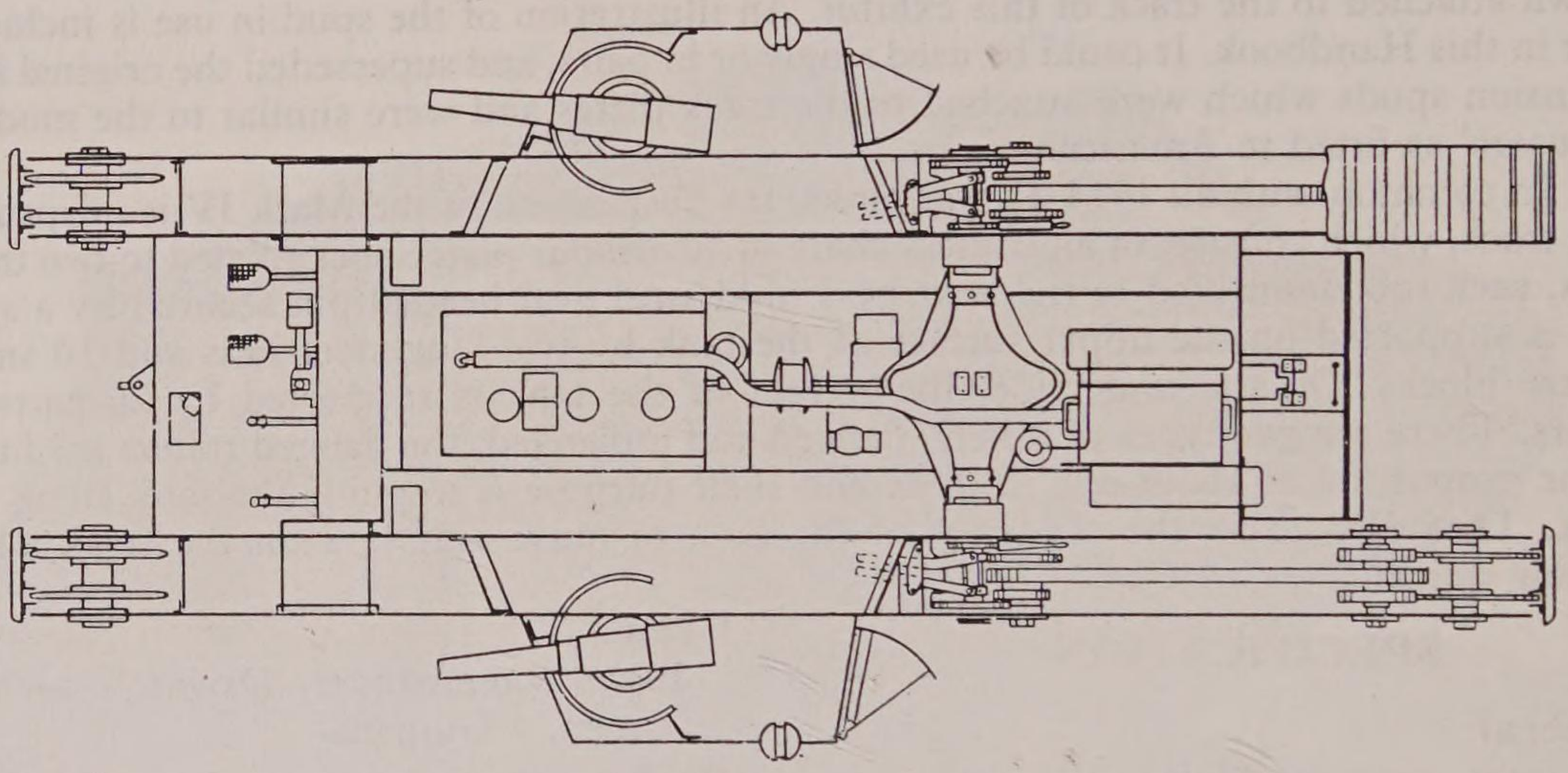
Ammunition

6-pr. shell	184	—
6-pr. case shot ...	20	—
Small arms ammunition	5640	12972

Signalling

Between driver and gearsmen	By hand, later by coloured electric lamps.
Tank to other troops	By flap shutter on pole and by pigeon.
Other troops to tank	Nothing provided.

LAYOUT OF MARK IV TANK



From the above diagram it will be seen that the general design of the early tanks was essentially simple. By modern standards they were extremely roomy inside, and the accessibility of the engine, transmission and controls made for ease in maintenance. Their obstacle-crossing capacity has never been equalled. They were, however, complicated to drive and steer, requiring four men to manipulate the gears and brakes.

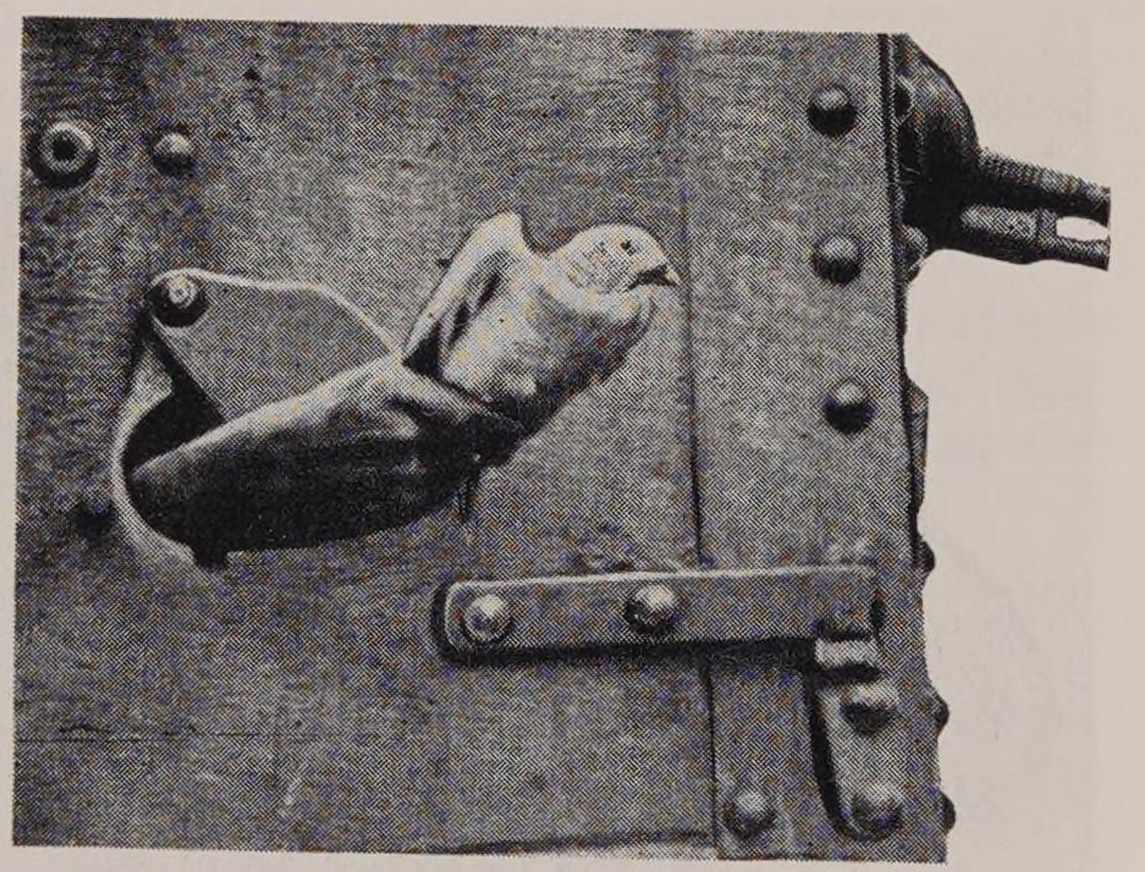
The driver's turret was fitted on the roof in the forepart of the hull. It accommodated both driver and commander, the latter sitting on the left and acting as brakeman. Between the two was a machine-gun.

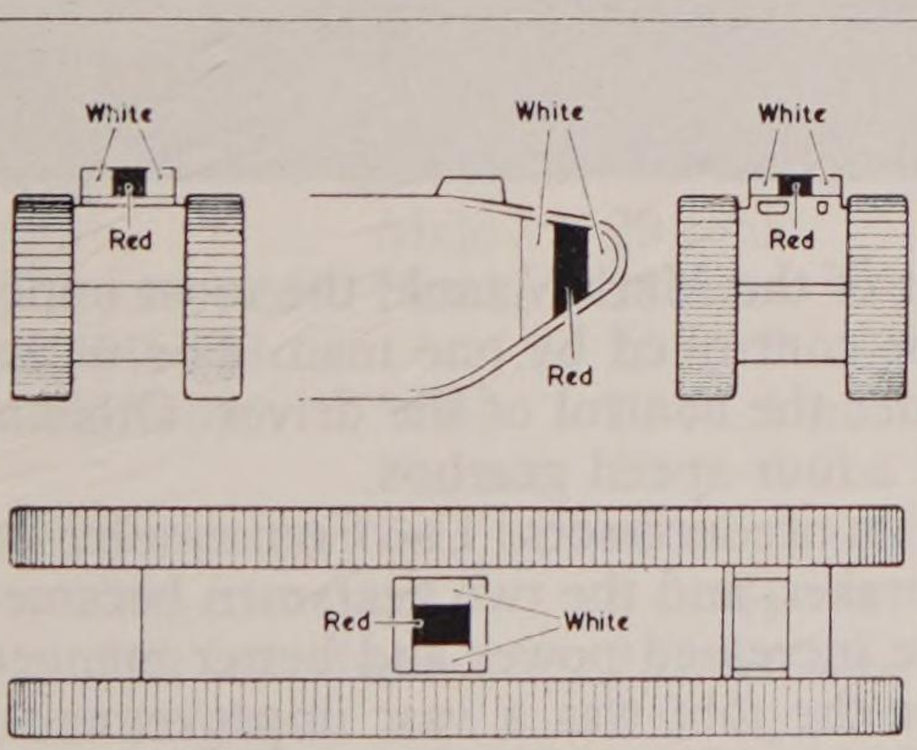
The sponsons fitted on each side of the hull contained either six-pounder guns or machine-guns according to the type of tank (i.e., male or female). These sponsons were removable on Marks I to III, but could be swung inboard on the Mark IV and subsequent Marks for purposes of conveyance by rail. To enable this to be done the short barrel (23 calibre) six-pounder had to be fitted. This was a great advantage, as the removal of sponsons for rail transit and their later reassembly meant hours of heavy work for the crew. Special trailers were provided for the tank to tow its sponsons when removed; one of these trailers is preserved in the Museum.

Each tank had four doors, a rear door in the back of the hull, one door per sponson, and a manhole in the roof. The crank handle for starting the engine, at which there was room for four men, was located behind the engine. The silencer, in the roof immediately above the engine, was an innovation on the Mark IV, previous types having straight through exhausts.

LAYOUT OF MARK IV TANK

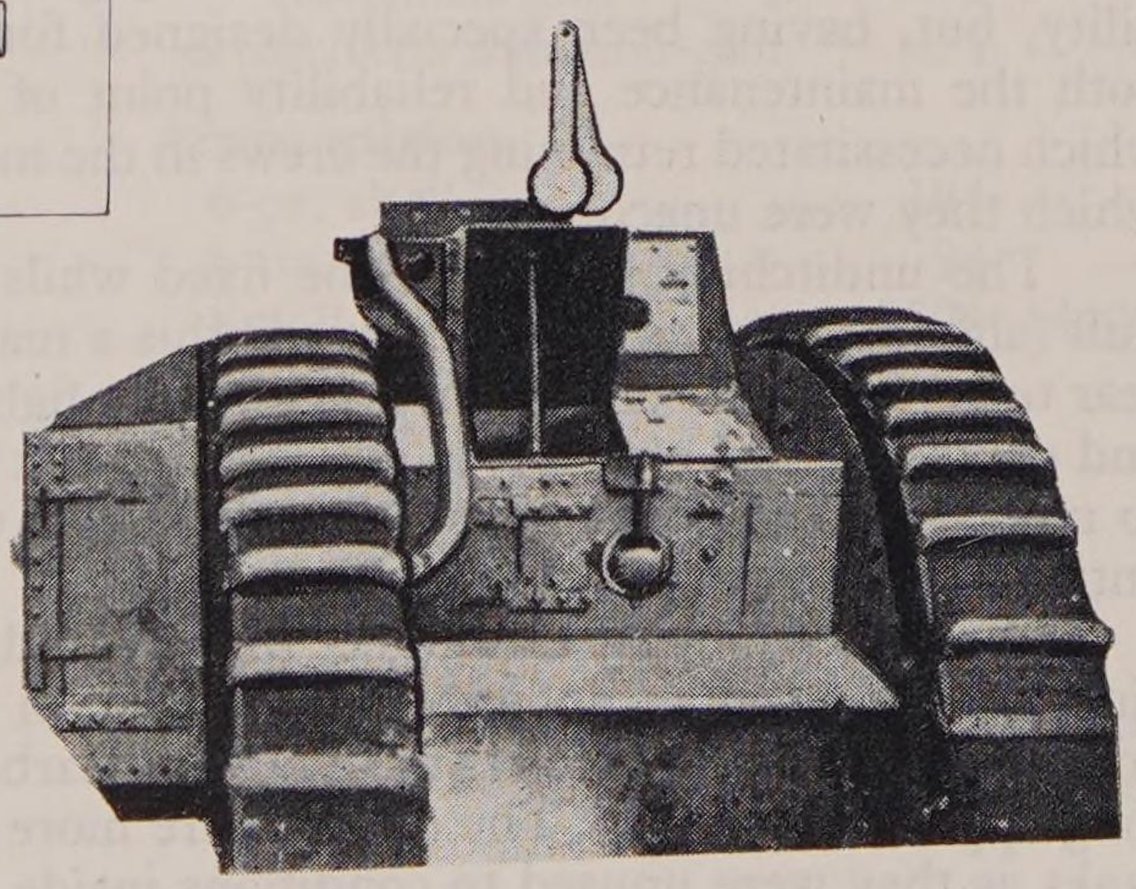
The use of pigeons for communication from tanks will probably seem fantastic to members of modern tank crews. But here is a photograph taken near Albert in 1918 showing one being released from a tank.



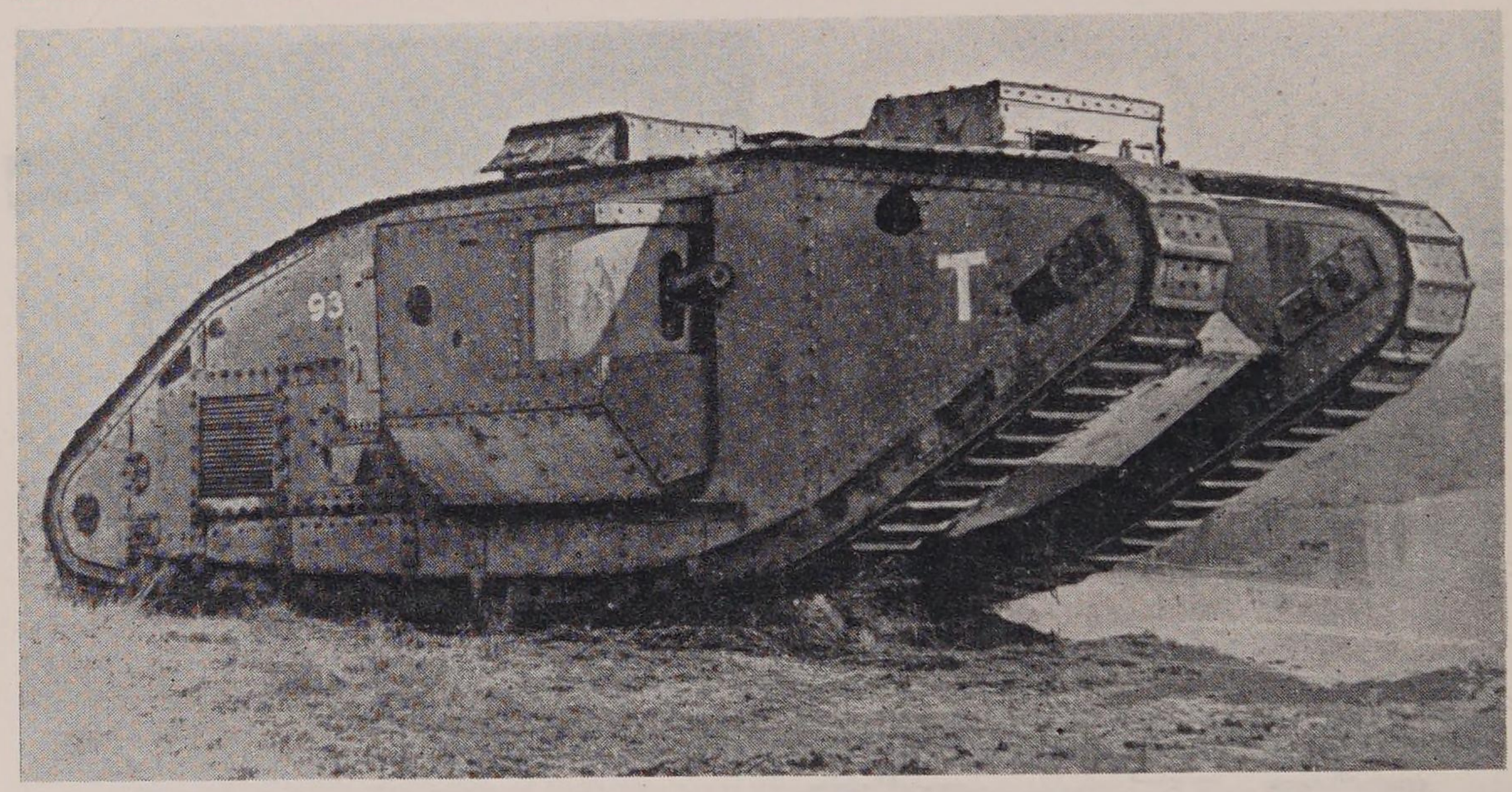


This diagram shows the standard identification marks laid down for air and ground recognition on all British tanks in the 1914-18 war. It does not appear, however, that the markings were ever adopted generally.

As a means of tank to tank communication semaphores of the types shown here were fitted, operated manually from the rear turret. They were not very successful since they were very vulnerable to small arms fire.



MARK V



Further experience led to the development of the Mark V tank, the most important improvement being that the tank could now be controlled by one man. The secondary gearboxes were replaced by epicyclic units under the control of the driver. Other modifications included increased engine power, and a four-speed gearbox.

The machine was a great improvement on its predecessors. The Commander was no longer hampered by the need to attend to the brakes, and the two gearsmen became full-time gunners. The new engine not merely gave increased power and better manoeuvrability, but, having been specially designed for the job, was a vast improvement from both the maintenance and reliability point of view. It was fitted with poppet valves, which necessitated retraining the crews in the maintenance of this type of valve gear, with which they were unacquainted.

The unditching gear could be fixed whilst under cover from the rear flaps of the hull (although in practice, mud made this a matter of luck). Observation was better, the rear turret having been designed as a proper fighting chamber. The doors were improved, and chutes opened outward to give better track cleaning. The stowage plan was designed to meet service requirements. A machine-gun was fitted in the rear plate, as the differential casing was now considerably smaller.

Ventilation, owing to the fact that the radiator was fitted inside the tank, was considerably worse than on previous models. In all these early tanks the crews suffered considerably from the effects of fumes and carbon monoxide poisoning, particularly after long approach marches. The effects were more marked in the case of infantry carried in tanks as they were unused to conditions inside the vehicles.

MARK V

In action, visibility was restricted to the commander's periscope and to the limited view offered by the minute peep-holes in the visor plates. If fire was at all heavy the periscope was soon put out of action.

This limitation of view made the crew almost entirely dependent upon their maps, the tank compass and upon preliminary ground reconnaissance. Each individual tank route had to be carefully planned. This planning became so well developed that the infantry came to rely almost entirely upon their accompanying tanks for direction.

The Mark V was designed in October, 1917, and altogether 400 (200 male, 200 female) were produced by the end of the war. They fought at Hamel, Moreuil, Amiens, Bapaume, 2nd Arras, Ephy, 2nd Cambrai, Selle and Maubeuge. The Museum exhibit was originally held on the establishment of the 4th Battalion, Royal Tank Corps. It carries the 'Chinese Eye' on its horns, which was the sign of that Battalion.

SPECIFICATION

General

Weight ... (fully stowed)	Male	29 tons
	Female	28 tons
Overall length	...	26 ft. 5 ins.
Overall Width	Male	13 ft. 6 ins.
	Female	10 ft. 6 ins.
Width for conveyance by rail		
$20\frac{1}{2}$ ins. shoes		8 ft. $8\frac{1}{2}$ ins.
$26\frac{1}{2}$ ins. shoes		9 ft. 0 ins.
Overall height	...	8 ft. $8\frac{1}{4}$ ins.
Ground clearance	...	1 ft. $4\frac{5}{8}$ ins.
Armour		
Maximum	...	14 mm.
Minimum ...	...	6 mm.
Petrol capacity	...	93 gals.

Engine

Ricardo 6-cylinder 150 h.p.

Crew

Eight: Commander
Driver,
6 Gunners.

Performance

Maximum vertical obstacle	4 ft. 6 ins.
Maximum width of trench crossed	10 ft. 0 ins.
Road speed ...	4.6 m.p.h.
Radius of action ...	45 miles

Armament

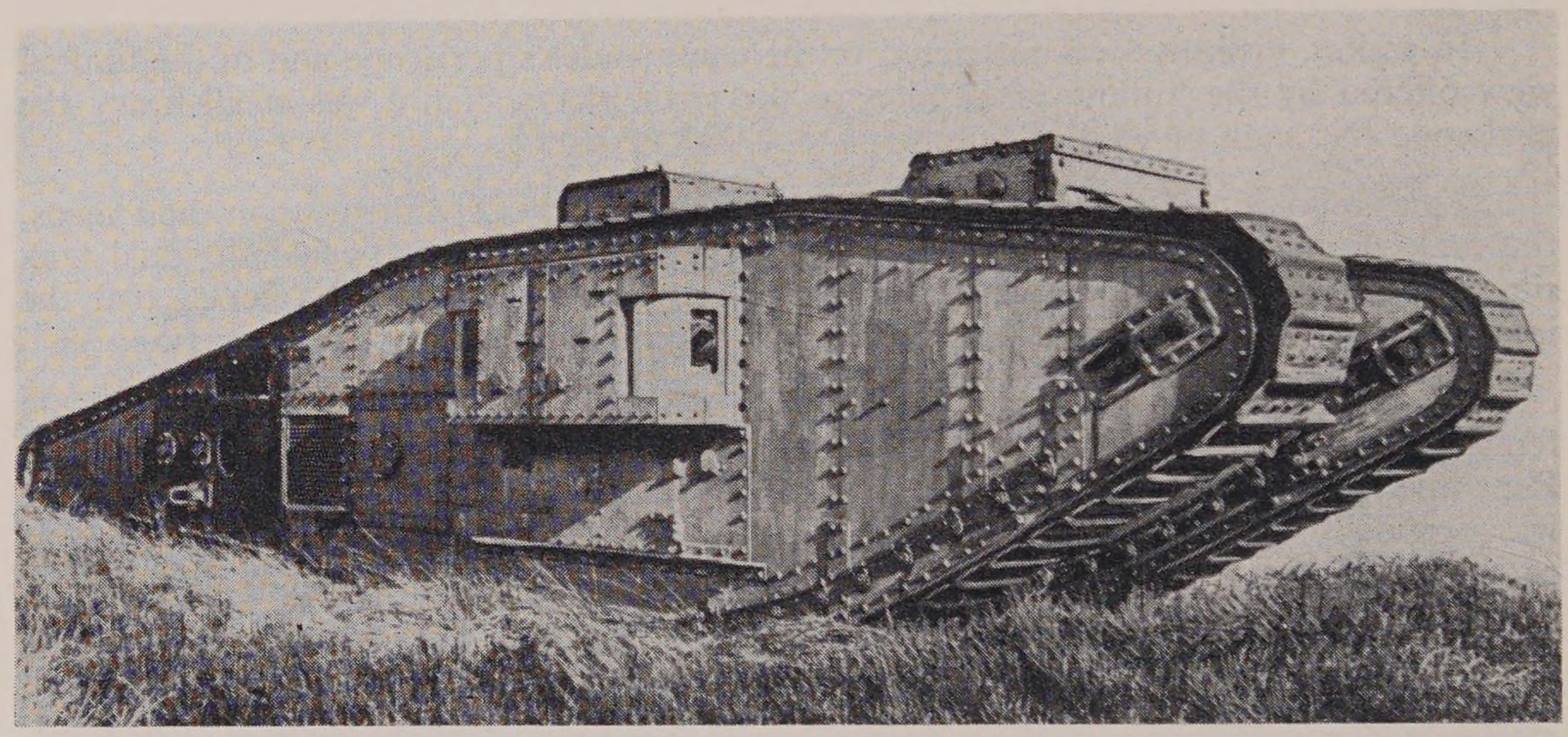
	Male	Female
6-pr. 23 calibre QF Hotchkiss gun ...	2	—
Hotchkiss machine-gun	4	6

Ammunition

6-pr. shell	183	—
6-pr. case shot ...	24	—
Small arms ammunition	5700	14100

Signalling

Inside tank	Voice tube.
Tank to other troops	Collapsible semaphore, Pigeon.
Other troops to tank	Bell which could be pulled from outside.



MARK IV TADPOLE

During the 1914-18 war trench-crossing capacity was a vital factor in tank design. 'Mother' and all its successors up to the Mark V could cross a ten-foot trench, but this was found insufficient for the prevailing static trench-warfare conditions in France.

The problem was first solved by equipping tanks with large brushwood fascines, carried on top of the hull, which could be dropped into a trench before crossing. An alternative was the crib, a wooden frame strengthened with angle iron and used in the same way. A picture of tanks carrying cribs will be found on a later page.

The use of fascines and cribs had severe limitations, as obviously they could only be used once. When several wide obstacles had to be crossed during an advance a very complicated plan was necessary to ensure that sufficient fascines were available at each crossing. Even so, they proved extremely useful, and the success of the first Battle of Cambrai in November, 1917, was largely due to this device.

Experiments to increase the trench-crossing capacity of the tanks themselves were carried out on an extensive scale towards the end of 1917. The first result was the Tadpole Tail, a device consisting of a pair of mild steel rear horns complete with extension to the chain drive, which could easily be attached to the existing hull.

A tail nine feet long increased the trench crossing capacity of the Marks IV and V to fourteen feet. The device was, however, not very successful. Manoeuvrability was seriously reduced and the extension proved too weak in service.

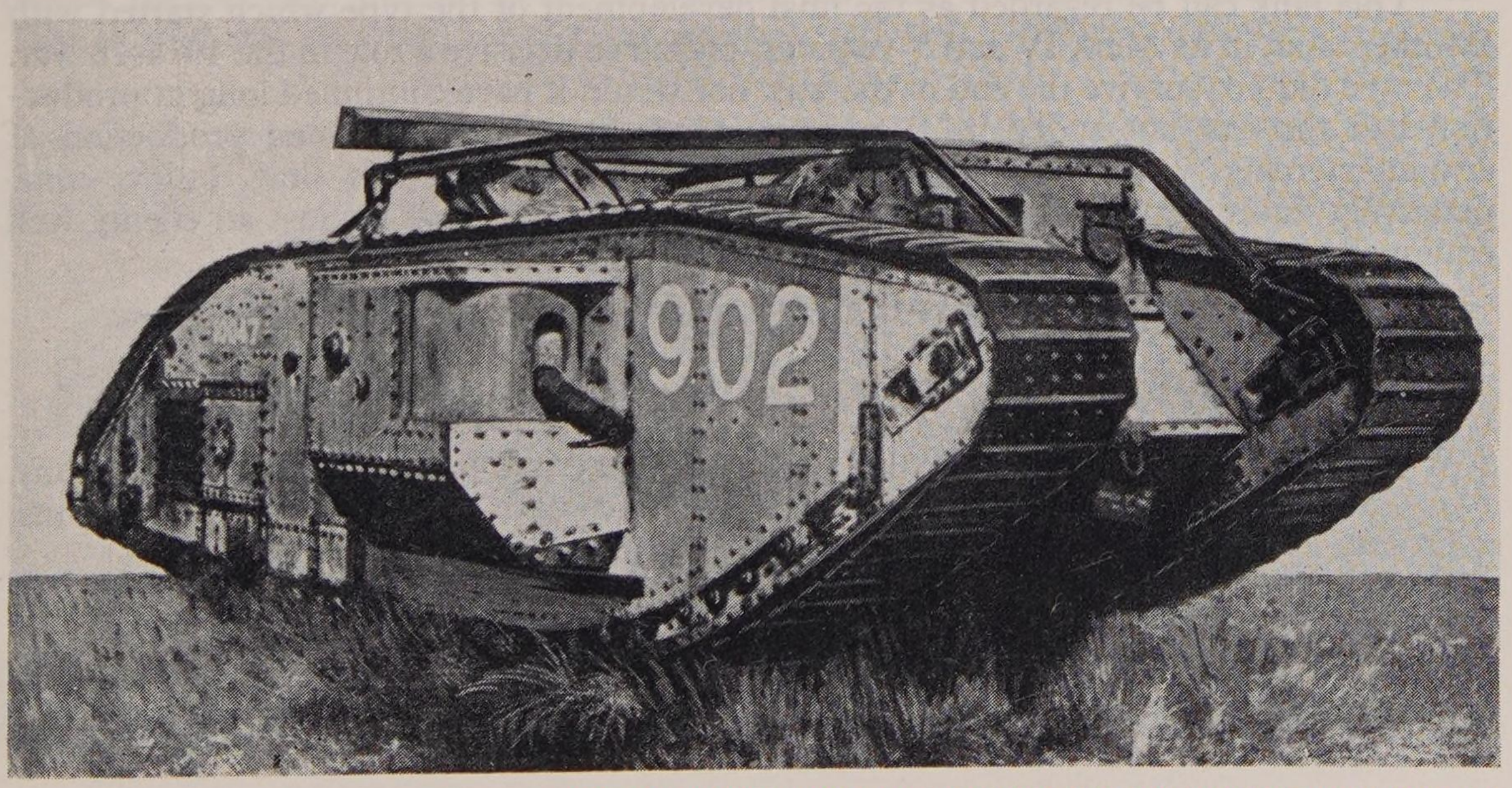
The next step towards a solution to the problem was taken at the Tank Corps Central Workshops in France, which were a vast engineering works covering 20 acres of ground. Here all badly crippled and burnt-out tanks, damaged engines and broken transmission parts, etc., were repaired. In fact, all repair work was carried out exclusively in these shops, so that the overworked factories in England were free to devote their entire energies to the production of new machines and spare parts.

In February, 1918, the Central Workshops produced an adapted Mark V lengthened by the insertion of three extra panels on either side of the hull immediately behind the sponson opening. This increased the length to 32 ft. 5 ins., and gave a trench-crossing capacity of thirteen feet. The mechanical arrangement corresponded to the Mark V except for the addition of a carden shaft between the flywheel and gearbox, which was necessary owing to the increased length.

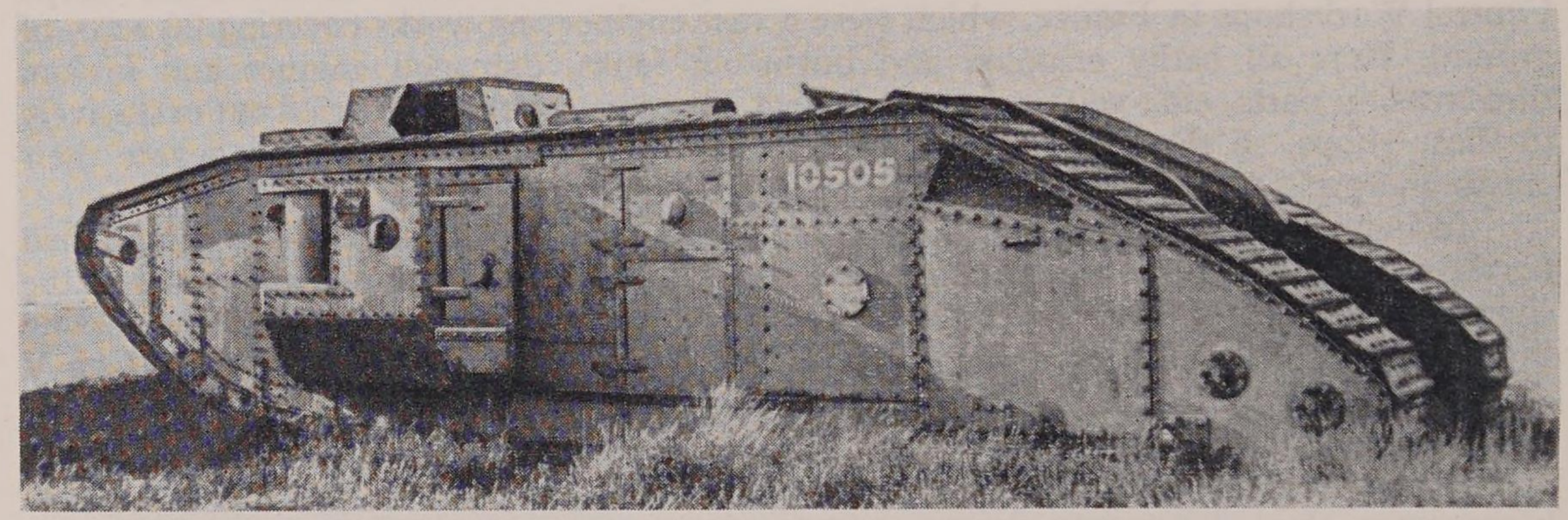
Although slightly less manoeuvrable than the Mark V, this new design, which became the Mark V*, was a great improvement on the Tadpole Tail. Its biggest asset was that Mark V* tanks could be produced quickly from existing materials which were plentiful.

The tank was soon in production, 200 male and 432 female machines being built by the end of the war. The weight of both male and female models was increased from the original Mark V by five tons. Some extra small arms ammunition was carried, but the machine was also capable of carrying 20 to 25 troops. An extra door was provided on each side in the new panels.

MARK V*



MARK V★★



In May, 1918, Major Wilson redesigned the Mark V★, the new tank being designated the Mark V★★. Although 300 were ordered, the machine exhibited was the only one to be completed. On trials in December, 1918, it was a complete success.

The length and width were the same as the Mark V★, but the contour was altered, the flat in the centre being reduced to six feet, and the rise forward made fuller. The engine was placed further back so that the central fighting chamber was in front of the engine instead of behind it. A larger Ricardo engine was fitted, giving increased speed and manoeuvrability.

This tank can be regarded as the final development of the type which started with 'Mother' and, in its Mark IV and V versions, played so decisive a role in the 1914-18 war. The type did not survive the end of the war, nor would it have continued long in production had the war not ended in November, 1918. For already German production of armour-piercing weapons was beginning on a big scale, and this slow, bulky, comparatively thinly armoured type of tank would have been useless against an enemy well equipped with effective anti-tank weapons.

The main points of difference from the Mark V specification are listed below.

SPECIFICATION

Weight ... Male 35 tons
Female 34 tons
Overall length ... 32 ft. 5 ins.
Overall height ... 8ft. $11\frac{3}{4}$ins.

Engine: Ricardo 6-cylinder
225 h.p. at 1,200 r.p.m.

Maximum vertical obstacle 4 ft. 3 ins.
Maximum trench crossed 13 ft. 0 ins.

Road speed:
at 1,200 r.p.m. ... 5.2 m.p.h.
at 1,600 r.p.m. (governor cut out) ... ... 6.9 m.p.h.
Radius of action ... 67 miles

MARK VI and VII

MARK VI

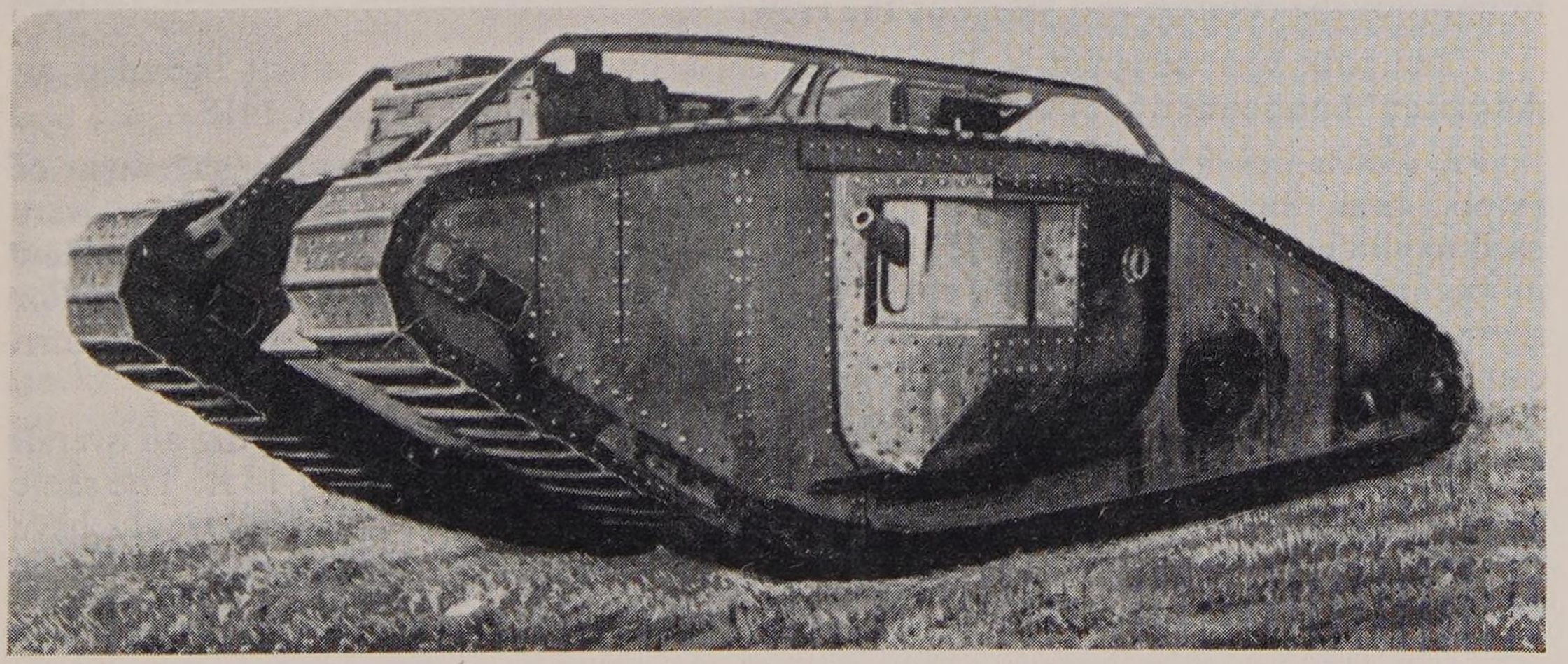
Although designed as early as December, 1916, the Mark VI tank did not reach the production stage, as the urgency for a high output of tanks precluded the introduction of a new type.

It was designed by Major Wilson, and a 'mock-up' was built. The most striking feature of the design was the abandonment of sponsons in favour of one six-pounder gun mounted in the centre line forward. Owing to the projecting horns, the traverse of the gun was limited to forty-five degrees. The engine was placed on one side of the hull, to allow for a central fighting chamber in which the crew could stand upright and obtain all-round machine-gun fire. The track width was increased to 29½ ins., giving improved performance on soft ground. Heavier armour (14 mm.) and the more powerful engine (Ricardo 150 h.p.) increased the weight to 30 tons.

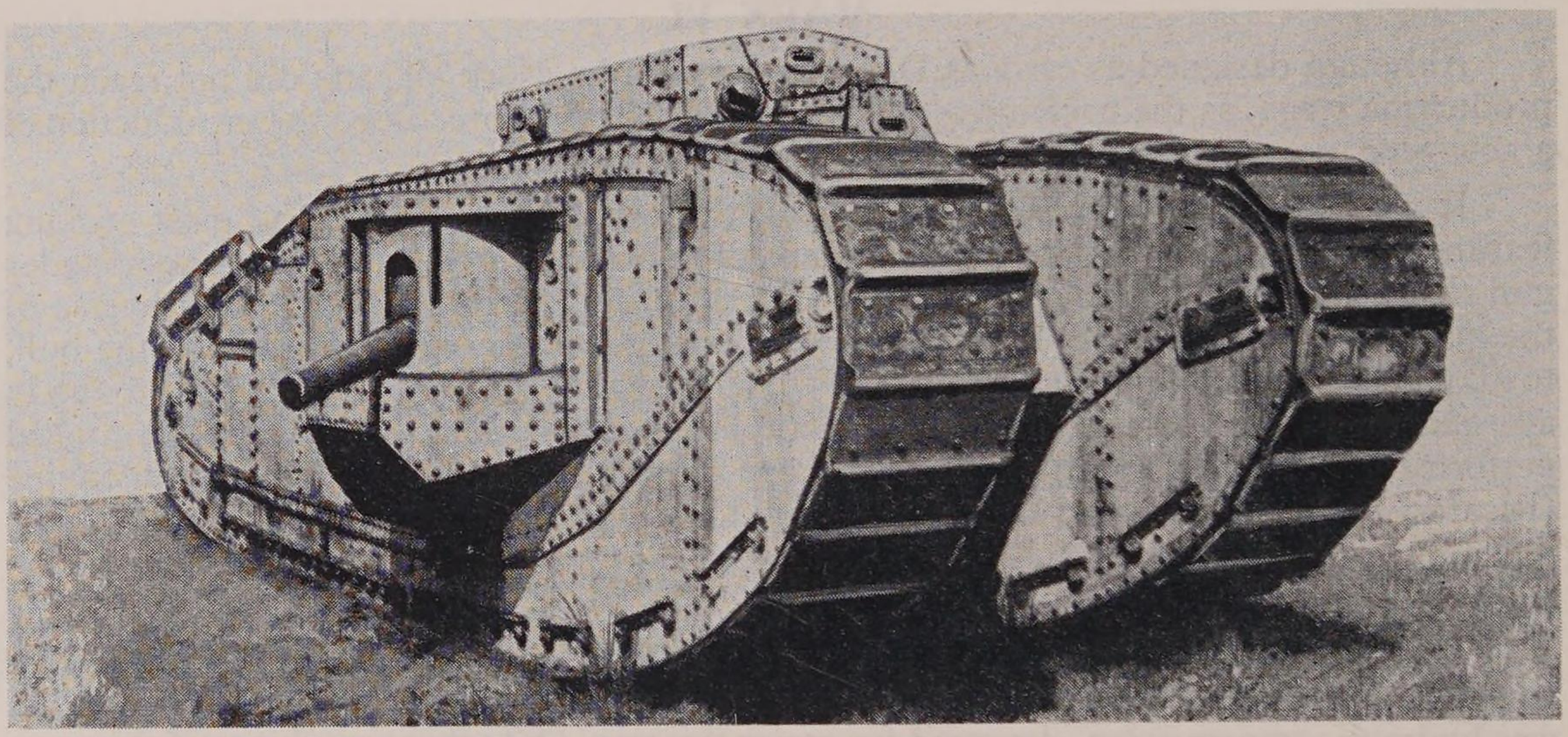
MARK VII

This machine was designed in December, 1917, and, except for an increase in length of 3 ft. 6 ins., the hull details were similar to the Mark V. The main innovation was hydraulic transmission, designed for easier steering. Only three machines of this type were built.

The drive was taken through a reduction gear to the gearbox, which consisted of two hydraulic pumps. Speed was controlled by two handwheels by which the driver controlled the pressure output from the pumps, the gear ratios being infinitely variable. This control was also used for steering, as each track was controlled separately.



MARK VIII



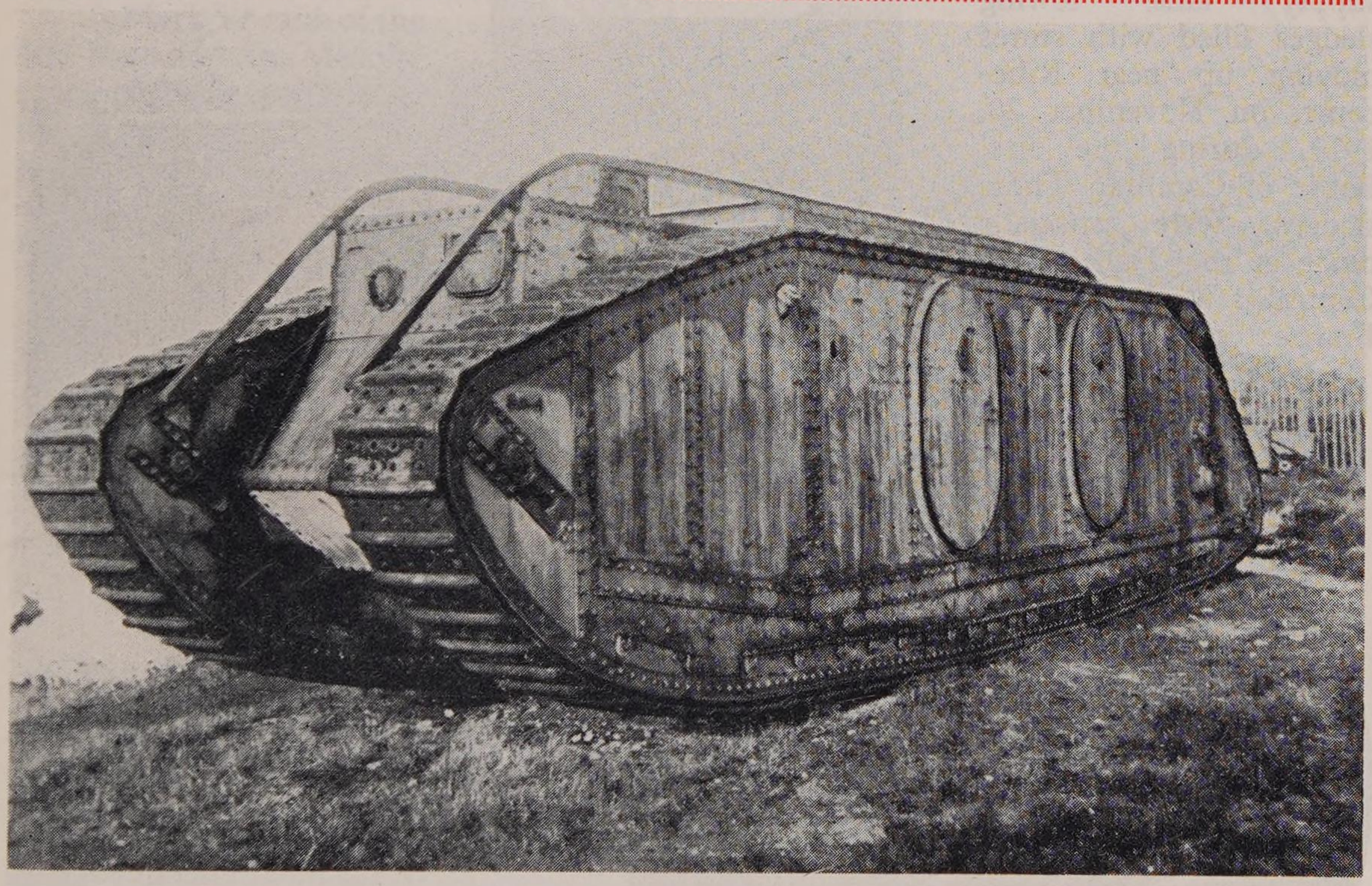
This was the largest tank constructed in the 1914-18 period, having an overall length of 34 ft. and a total weight of 37 tons. The Mark VIII, sometimes called the 'Allied' tank, was primarily intended for the American Army, and it was to have been built in the U.S., using a 300 h.p. Liberty aero engine. For British use a 300 h.p. Ricardo engine was designed. The engine was cut off from the fighting chamber by a bulkhead to improve the comfort and safety of the crew.

The tank was designed in December, 1917, by a Committee which included an American representative. Seven were built in this country by the end of 1918.

A clutch was fitted to the flywheel and was only used to facilitate engagement of reverse gear, there being no main gearbox. Two compound epicyclic gearboxes were used to obtain neutral and two gear ratios. By selecting high gear in one epicyclic and low in the other it was possible to obtain a 'powered turn' with a radius of 10 ft. 6 ins. For sharp turns low gear was selected on one side and neutral on the other, when a skid turn could be made by applying the footbrake.

An even larger machine was designed but not built (Mark VIII*), having an overall length of 44 ft., a total weight of 42 tons and a trench crossing capacity of 18 ft. The same transmission was to have been used, but with four-speed epicyclics. This would have resulted in four different turning circles of fixed radii, dependent on the gears engaged in each epicyclic.

MARK IX



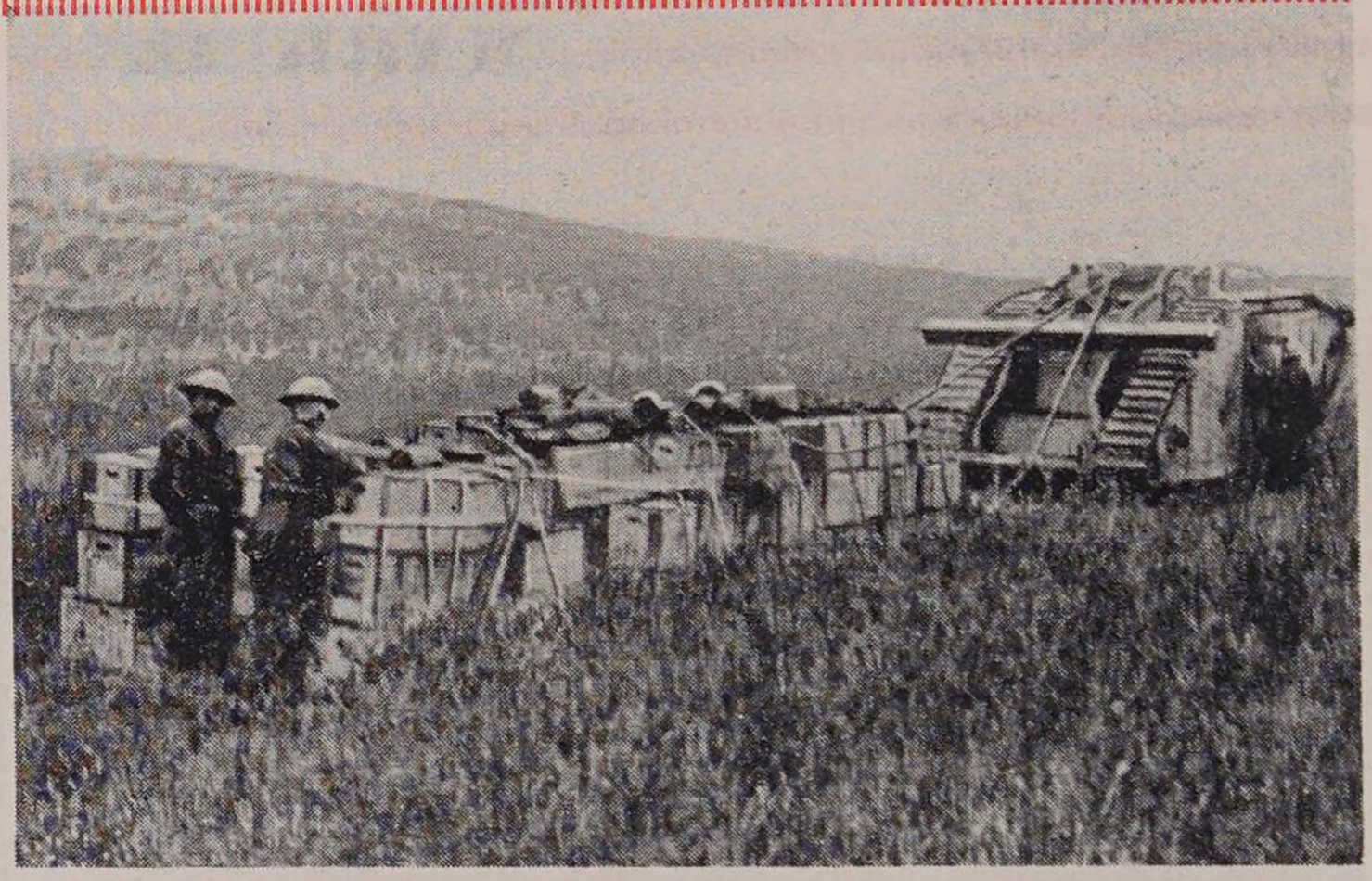
This machine was designed in September, 1917, to meet a requirement for carrying infantry and stores over broken ground in an enclosed armoured vehicle. Earlier marks of tanks had already been adapted for this purpose, but this was the first machine specially designed to carry stores. In order to retain standardisation as far as possible the design was based on the Mark V. The main departures were the placing of the engine well forward, and the slope at the back end being made as steep as possible. By this means a hold was made available in the centre of the machine encumbered only by the long transmission shaft running fore and aft on the centre line. The hold capacity was 550 cubic feet, which was sufficient to carry 50 men or 10 tons of stores.

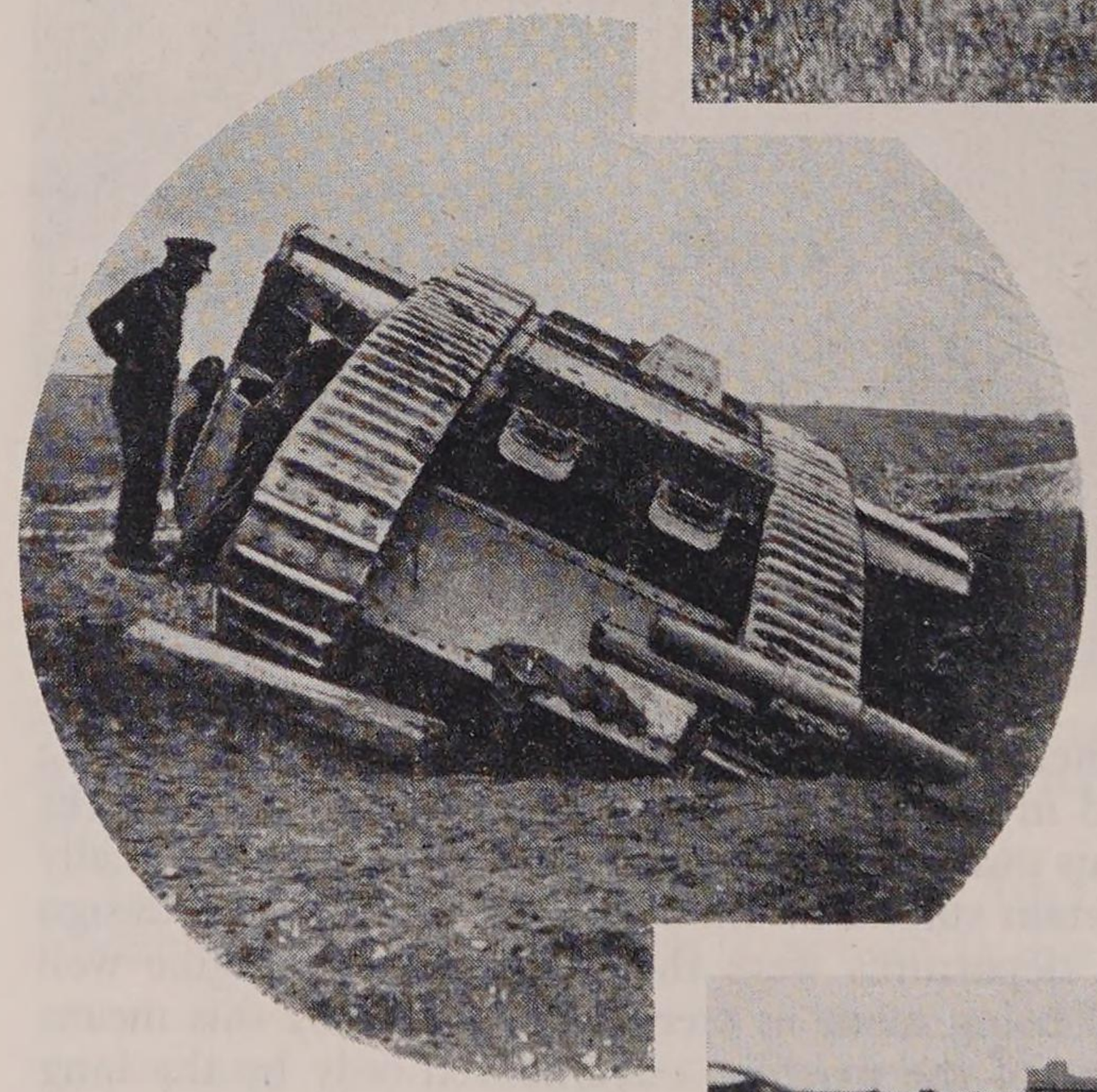
A light structure was also arranged along the whole length of the hull between the tracks for stowing cargo on the roof. Shackles, eyebolts and removable partitions were provided for stowing cargo inside. The vehicle was designed by Lieut. Rackham and 35 were built by the end of 1918. The laden weight was 37 tons, and the crew of four included two machine-gunners.

Improved ventilation was obtained by completely enclosing the engine with an asbestos lined metal casing extending to the roof, where air louvres were fitted. Fan vanes were fitted to the flywheel. Thus a continuous current of air was drawn from inside the machine, passed round the engine, and out through the roof louvres, carrying away all fumes and heat.

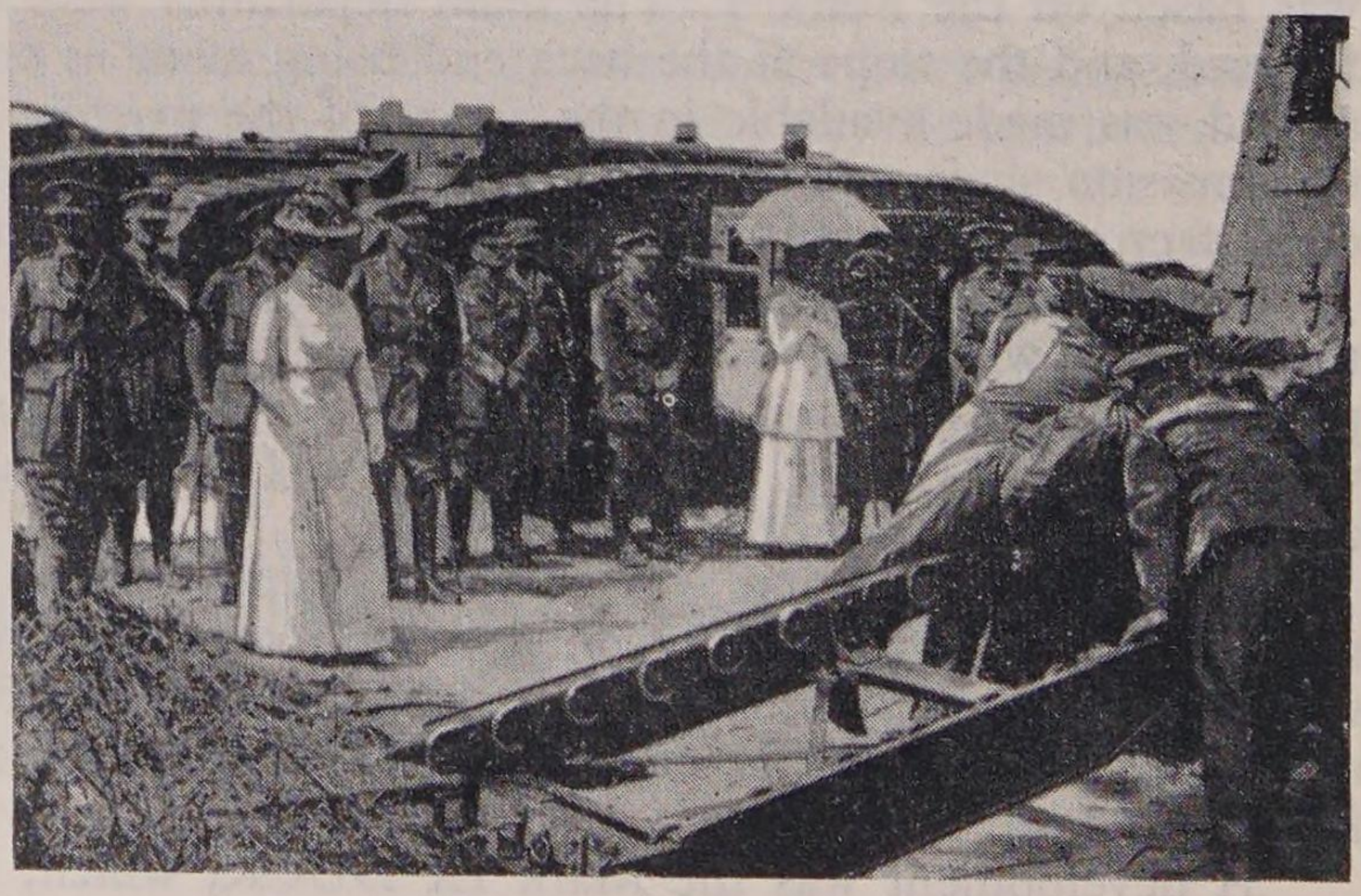
A development was the Mark IX DUCK, which, with the addition of 'Camels' strapped on the side, could be successfully floated.

An adapted Mark IV supply tank towing sledges filled with stores moving up near Ribecourt, on November 20, 1917, during the first Battle of Cambrai. These sledges were specially made at the Tank Corps Central Workshops in France.



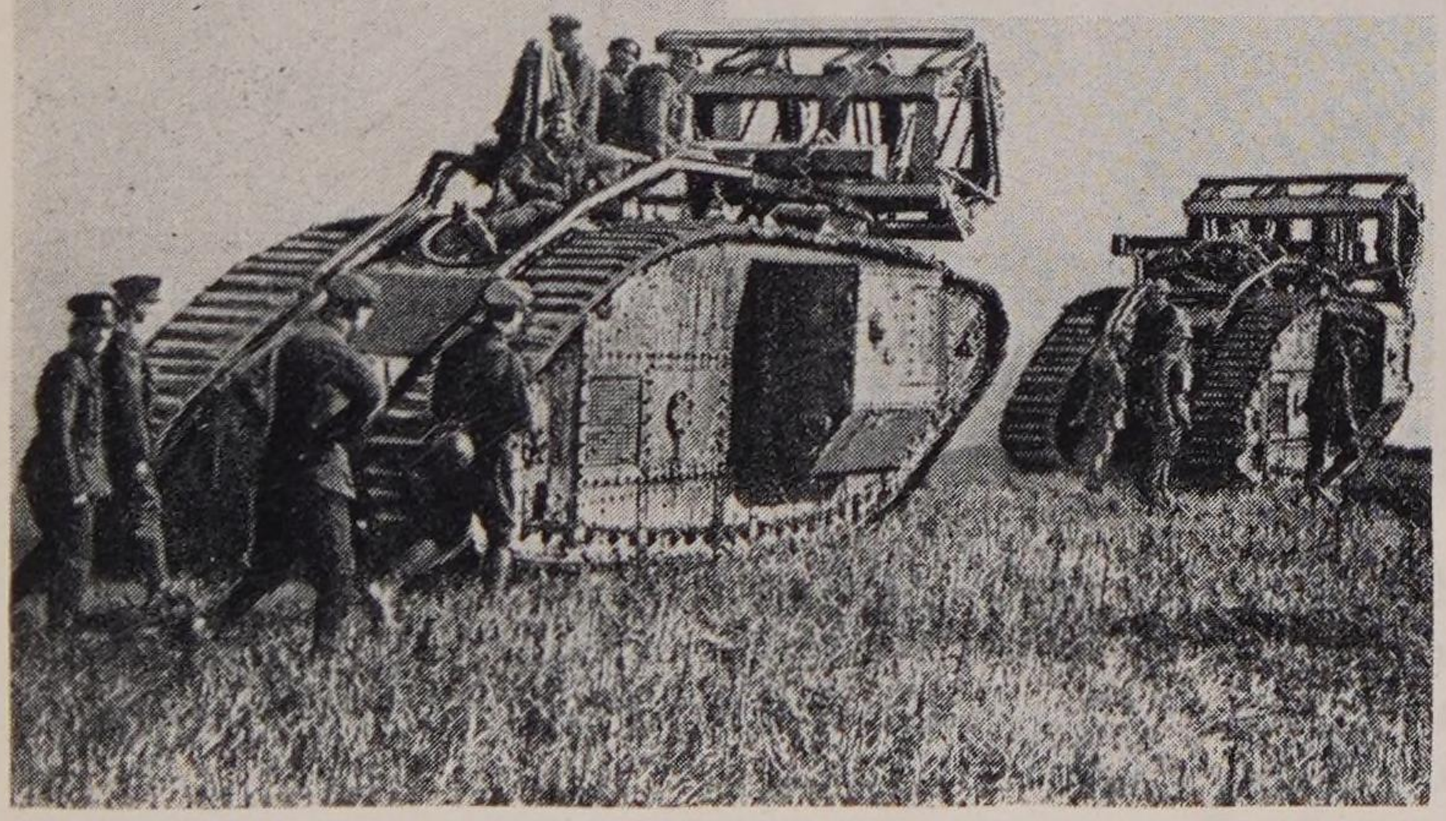


A torpedo spud in use. This type of unditching device was replaced by the unditching beam, which proved to be far more effective.

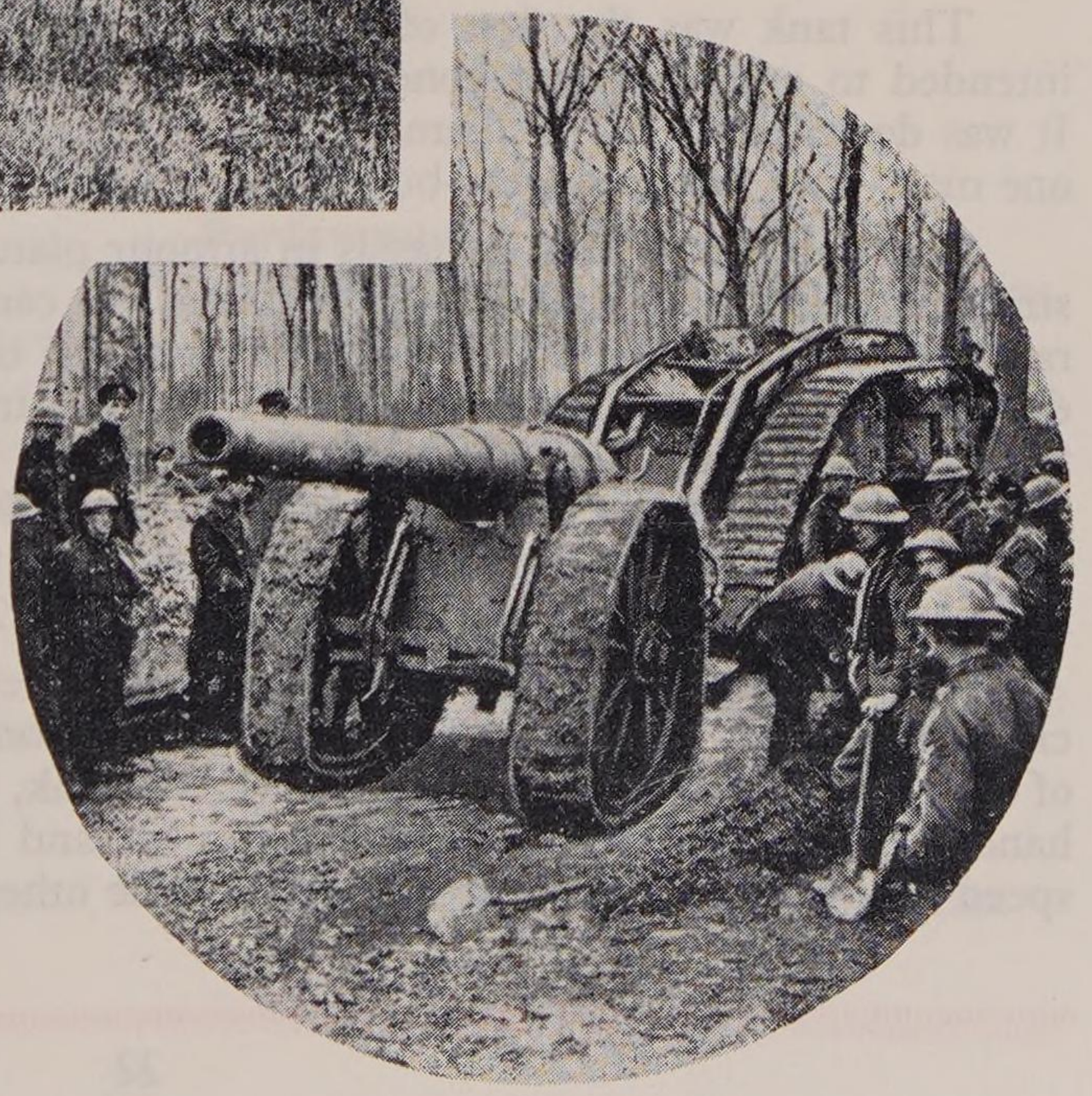


H.M. Queen Mary with Gen. Elles (on her right) and Brig.-Gen. the Earl of Shaftesbury (on her left) and the Countess of Airlie at the Tank Corps Central Workshops at Erin, in France, on July 7, 1917.

A Mark V* tank of the 4th Battalion in Meaulte soon after the capture of the town by the 5th Royal Berkshire Regiment of the 12th Division, on August 22, 1918.



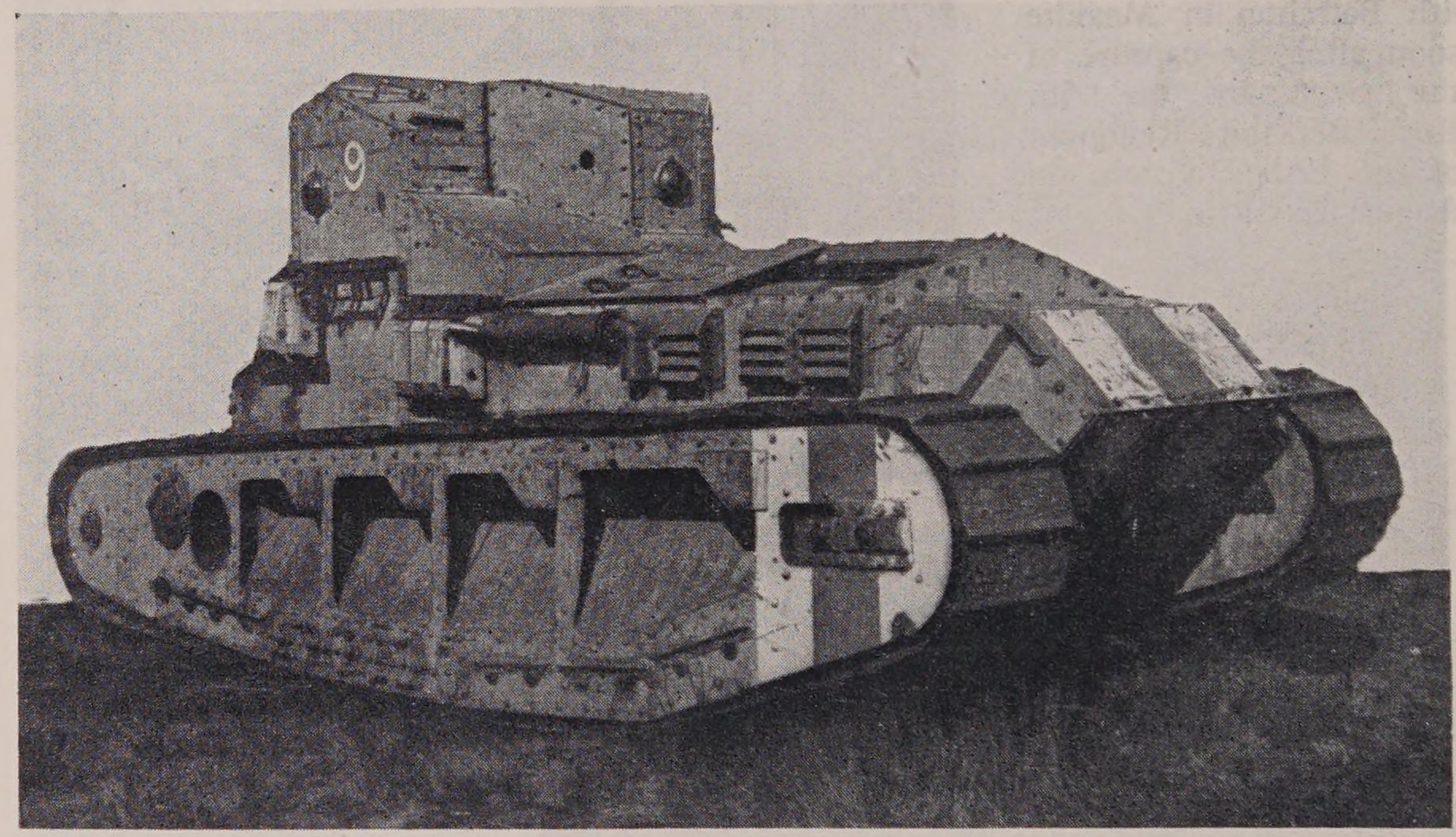
Mark V tanks going forward with the 'cribs' carried to enable them to cross the Hindenburg Line, at Bellicourt, September 29, 1918.



A 'C' Battalion Tank bringing in a captured 5.9 in. naval gun to the wood east of Ribecourt on the Marcoing Road, on November 29, 1917.

BRITISH FIGHTING TANKS—MEDIUM—Marks A to D

MEDIUM MARK A (WHIPPET)



This tank was the first of a series of lighter and more manoeuvrable machines intended to operate under conditions of more open warfare when the occasion arose. It was designed by Sir William Tritton in December, 1916 and could be controlled by one man. Two hundred were built by the end of 1918.

The hull proper was a chassis in armour plate with almost continuous mud chutes stretching along its whole length. A turret was carried at the rear and the two engines, radiators, transmission and petrol tank occupied the front of the hull. The tracks were driven independently, each engine driving one track through a separate cone clutch, four-speed constant mesh gearbox and worm gear. The final drive shafts could be locked together by means of a dog clutch to drive the tank straight ahead. A friction clutch was fitted so that when the dog clutches were engaged the power which could be transferred from one shaft to the other was limited to about 12 h.p.

Engine control was by means of a hand-lever mounted on a quadrant within the circumference of a small handwheel. The lever controlled the setting of the carburettors of each engine through a linkage. To steer the tank, the dog clutch was disengaged and the handwheel turned, thus opening one throttle and closing the other. This increased the speed of one engine and decreased that of the other within the limits set by the lever.

MEDIUM MARK A (WHIPPET)

Extension tails were designed for this tank to improve the trench-crossing capacity. One resembled the steering tail fitted to Mark I tanks, and the other was a plain skid tail. Neither was satisfactory, as they caused excessive track slip.

The Whippet was first employed on March 26, 1918, in a minor action near Hebuterne. On April 24, 1918, seven of these tanks were responsible for an amazing feat of arms south of Villers Bretonneux when three German battalions were overrun.

On August 8, 1918, 'Musical Box', a Whippet from the 6th Battalion, penetrated nearly eight miles behind the German lines at Villers-Bretonneux in one of the most extraordinary achievements of the war.

The Museum exhibit, 'Caesar', was the tank in which Lieut. C. H. Sewell won the Victoria Cross at Bapaume on August 29, 1918, when he lost his life rescuing the crew of another tank of his section which had overturned and caught fire.

Whippet tanks were designed for use as raiders in conjunction with cavalry. The Whippets were to precede the cavalry in order to silence machine-guns, deal with wire and generally to pave the way.

In practice, however, the cavalry was seldom able to act with them, mainly through the lack of a suitable means of communication during action. Partly in consequence of this, partly owing to the state of open warfare being of short duration, the Whippets, though having many brilliant feats to their credit, remained creatures of promise rather than of achievement. A promise which was amply fulfilled by their offspring, Crusader, Cromwell and Comet, in the war of 1939-1945.

A brief specification of the Whippet is given below.

SPECIFICATION

General

Weight (fully stowed)	...	14 tons
Overall length	...	20 ft. 0 ins.
Overall width	...	8 ft. 7 ins.
Overall height	...	9 ft. 0 ins.
Ground clearance	...	1 ft. 10 ins.
Armour (maximum)	...	14 mm.
Petrol capacity	...	70 gals.

Engines

Two Tylor JB4 4-cylinder, 45 h.p. each.

Crew:

Three: Commander, Driver, Gunner.

Performance

Maximum vertical obstacle		2 ft. 6 ins.
Maximum width of trench crossed	... ...	7 ft. 0 ins.
Road speed	...	8.3 m.p.h.
Radius of action	...	80 miles

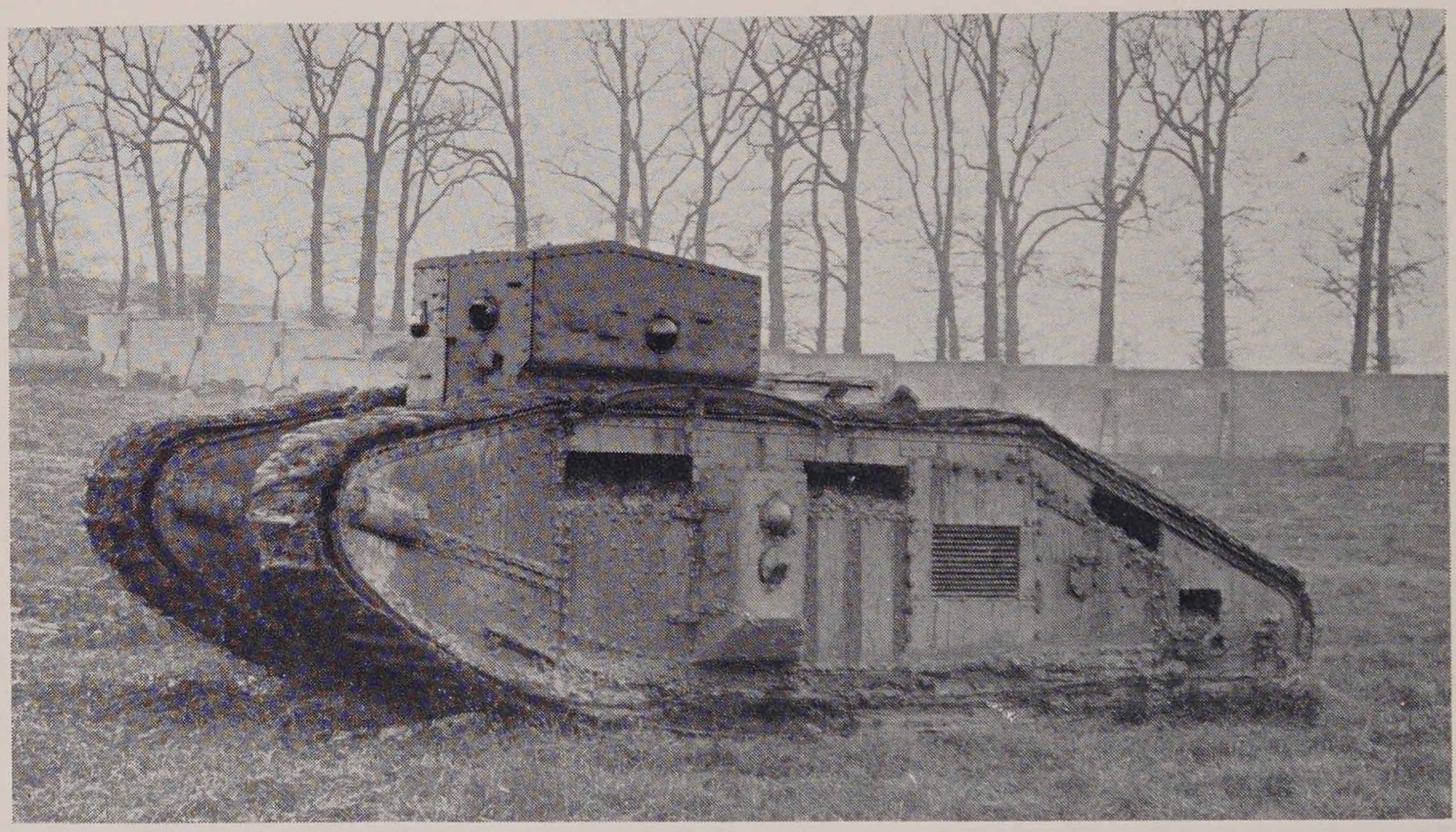
Armament

Hotchkiss machine-guns	4
Small arms ammunition	5,400

Signalling

Tank to other troops	By pigeon.
Other troops to tank	No provision.

MEDIUM MARK B



Owing to the high degree of driving skill necessary to avoid stalling one or both the engines of the Medium Mark A, the one-engined Mark B was developed, embodying at the same time a number of other modifications. It was designed in June, 1917, and 45 were produced. The hull was divided into two compartments, with a fighting chamber forward and an engine compartment in the rear. One four-cylinder Ricardo engine was fitted, and the normal method of steering by epicyclics was employed.

The track contour was improved, giving better climbing power and a maximum vertical obstacle performance of 3 ft. 2 ins. Trench crossing was increased to 8 ft.

This was an unpopular tank as the accessibility was very bad, and numerous alterations had to be made to enable repairs and adjustments to be carried out.

SPECIFICATION

General

Weight (fully stowed)	...	18 tons
Overall length	...	22ft. $9\frac{1}{2}$ins.
Overall height	...	8 ft. $4\frac{3}{4}$ ins.
Overall width	...	9 ft. 3 ins.
Ground clearance	...	1 ft. $5\frac{3}{4}$ ins.

Engine

Ricardo 4-cylinder.
100 h.p. at 1,200 r.p.m.

Crew

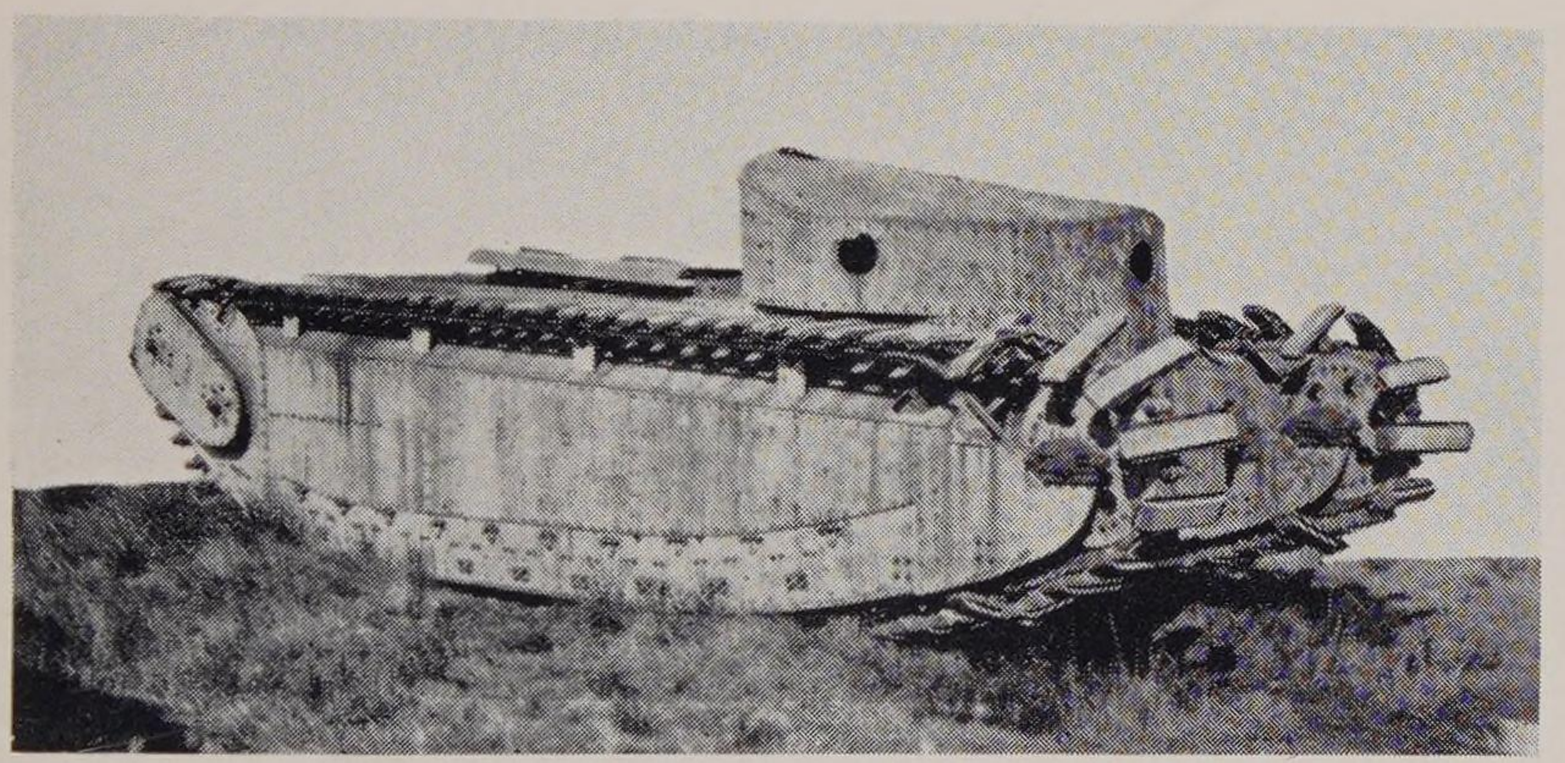
Four: Commander, Driver, Two Gunners.

Performance

Maximum vertical obstacle		3 ft. 2 ins.
Maximum width of trench crossed	... ...	8 ft. 0 ins.
Road speed	...	6.1 m.p.h.
Radius of action	...	65 miles

Armament

Two-pounder gun (experimental)	1
Hotchkiss machine-guns	4



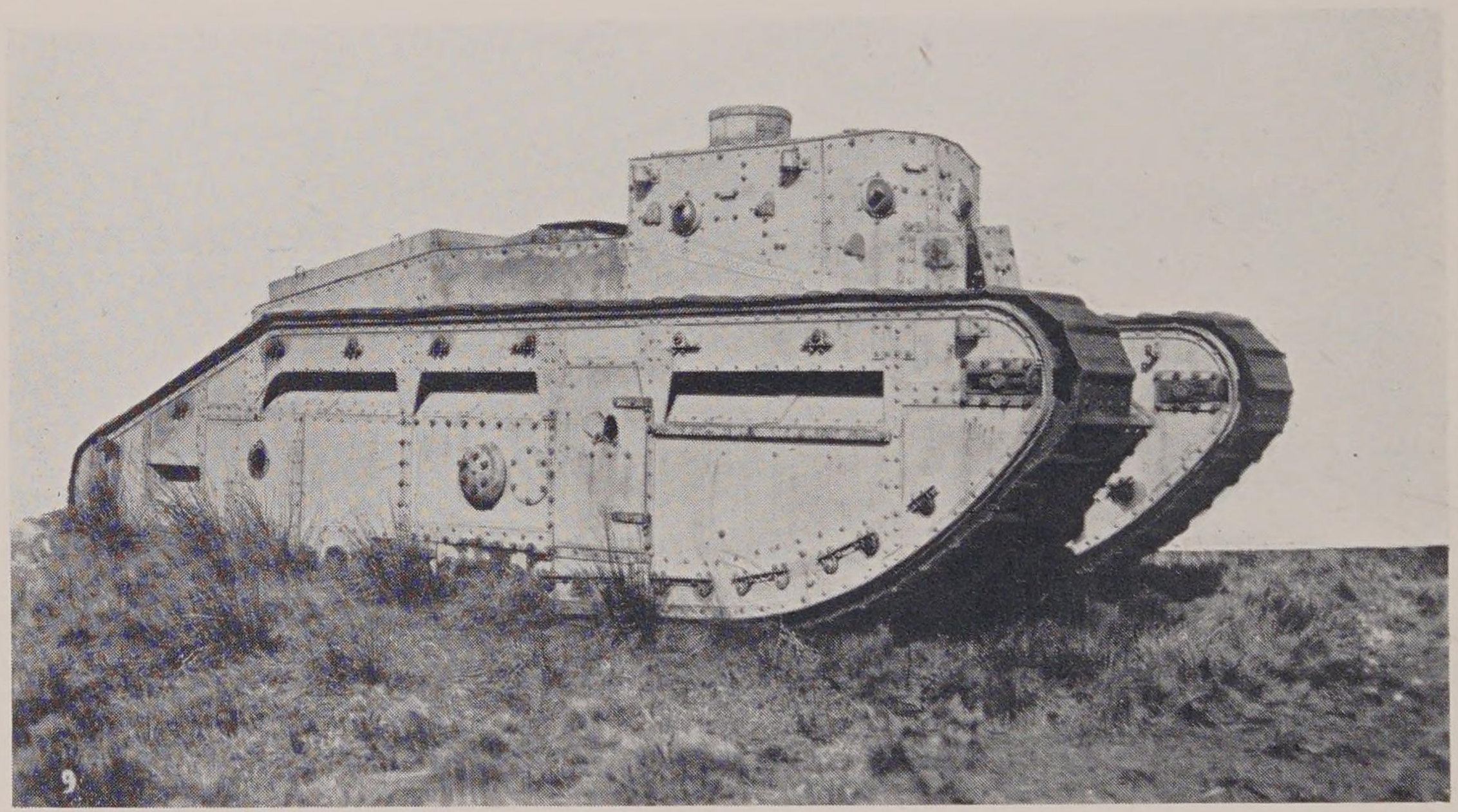
EXPERIMENTAL "D"

An experimental Medium, this tank weighed 18 tons, had a wire rope suspension, and a speed of 18 m.p.h. It was powered by a 325 h.p. Siddeley-Puma engine. The track plates were completely articulated.

WHIPPET TANK

A typical picture of Whippet tanks going into action. Tanks of the 3rd Battalion are shown on the move near Albert on March 28, 1918.

MEDIUM MARK C



This tank, designed by Sir William Tritton in December, 1917, was intended to fulfil if possible the Tank Corps specification for an ideal medium tank.

It was produced as the result of battle experience and incorporated numerous refinements asked for by tank crews. In many ways it compares favourably with more modern tanks, particularly in the consideration given to stowage.

Although a medium tank, the hull formed a frame to carry the tracks. The engine was placed in the rear, with the flywheel and gearbox forward. There was a large front turret, and in the male machine a six-pounder gun was mounted forward with spherical machine-gun mountings in the sides. A commander's revolving turret was mounted on top of the front turret. Firing platforms were arranged round the main turret for the use of machine-gunners.

The engine radiators were cooled by a powerful fan drawing air through a port in the roof. By opening a shutter in the fan casing air could be blown into the interior of the tank to ventilate it. This was altered in later models and the fan drew its air from inside the tank. A further fan cooled the exhaust system, which frequently became red hot.

Stowage bins were provided inside the hull for the crews' kit, rations and water. The tools and spare parts were stowed on boards, with recesses for each tool, on the sides of the engine room, where bins were also provided for carrying spare engine and transmission oils.

Eleven vision ports were provided in the turret and hull, with rotary shutters. In addition there were three periscope openings, but only one periscope, which could be moved from one position to another as required. The large driver's outlook visor could be closed by the driver by means of a handwheel and screw. Five revolver ports were fitted (nine on female tanks) and an anti-aircraft mounting. To assist the commander in navigation a distance indicator was driven off the final drive, and an aero type compass was fitted. The commander also had a map table and a drawer for stowing spare maps.

The vehicle was camouflage painted and could be further concealed by nets carried on struts round the hull, or by smoke produced by acid injected into the exhaust. The latter was considered unsatisfactory as the tank invariably ran ahead of the smoke. A charge of gun cotton was placed near the gearbox for demolition purposes should the tank have to be abandoned.

The driver operated all controls, which were as follows:

On right of driver's seat: Hand lever controlling throttle.
Hand lever controlling magneto.
Gear change lever (four forward speeds).

On left of driver's seat: Reverse gear lever.

Two steering levers in front of driver, controlling epicyclic reaction brake bands.

Clutch pedal. Track brake pedal

Thirty-six of these tanks were built, and brief specification details are given below.

SPECIFICATIONS

General

Weight (fully stowed)	...	19½ tons
Overall length	...	25ft. 10ins.
Overall width	...	8ft. 10½ins.
Overall height	...	9 ft. 7½ ins.
Ground clearance	...	1 ft. 6 ins.

Armour

Maximum	...	12 mm.
Minimum ...	...	6 mm.
Petrol capacity	...	150 gals.

Engine

Ricardo 6-cylinder (light)
150 h.p. at 1,200 r.p.m.

Crew

Four: Commander,
Driver,
2 Gunners.

Performance

Maximum vertical obstacle		3 ft. 9 ins.
Maximum trench crossed		10 ft. 0 ins.
Road speed	...	7.9 m.p.h.
Radius of action	...	120 miles

Armament

		Male	Female
6-pr. 40 calibre QF			
Hotchkiss gun	...	1	—
Hotchkiss machine-guns		3	4

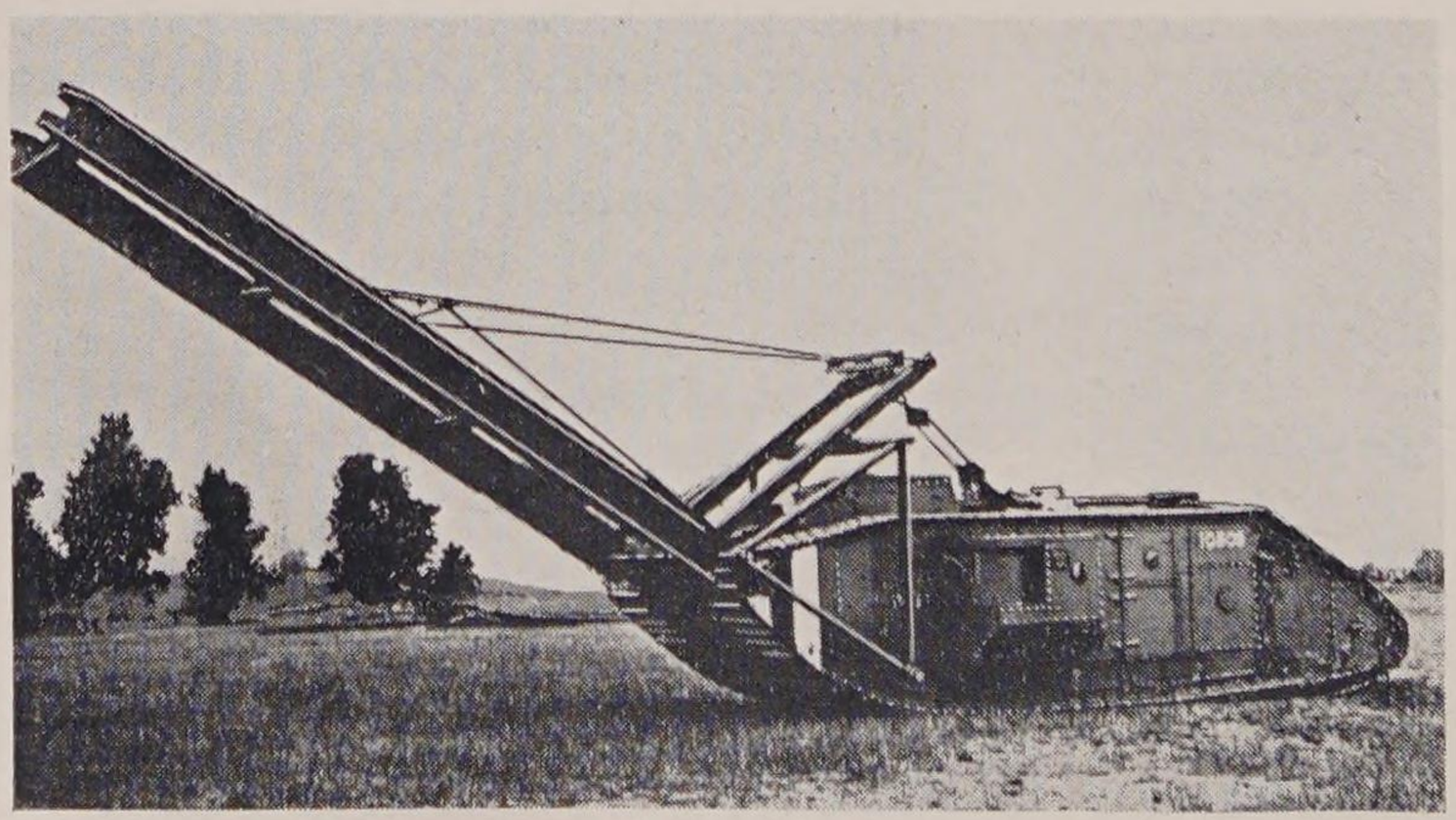
Signalling

Internal	Voice tubes.
To other troops	Semaphore.
	Pigeon.
	Siren.

From other troops
Bell-pull outside tank to attract crew's attention.

THE FIRST SP GUN

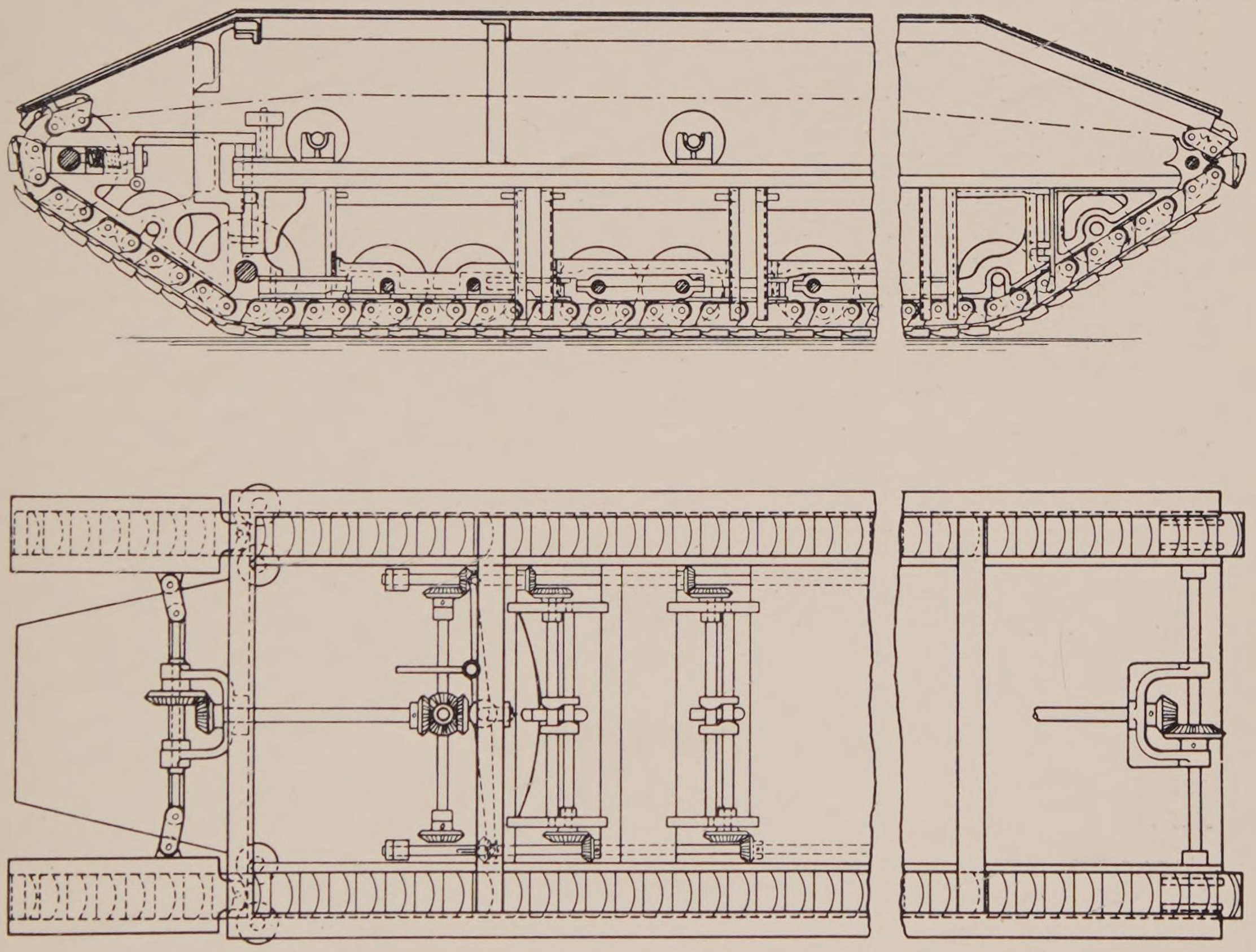
This machine was designed in July, 1916, to transport guns across broken country. It could carry either a 60-pounder gun or a 6 in. howitzer and 60 rounds of ammunition, but was chiefly used for the carriage of supplies. The gun platform was braced to allow the gun to be fired from the tank. Forty-eight of these machines were built.



THE FIRST BRIDGING TANK

Reminiscent of specialised armour in the second world war. This is a Mark V** mounting an experimental bridge.

DE MOLE'S PLAN



Drawing of an endless track vehicle submitted to the War Office by Mr. E. L. de Mole, of North Adelaide, South Australia, in 1912 and again in 1915. Unfortunately the plan, although it was officially admitted that it would have made a better machine than that which went into action at the Battle of the Somme, was pigeon-holed and therefore not used at all in the evolution of tanks. Mr. de Mole served as a private in the 10th Battalion, Australian Imperial Force.

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